

STARTING/CHARGING SYSTEMS

SC(H4DO)

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General Description

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATION

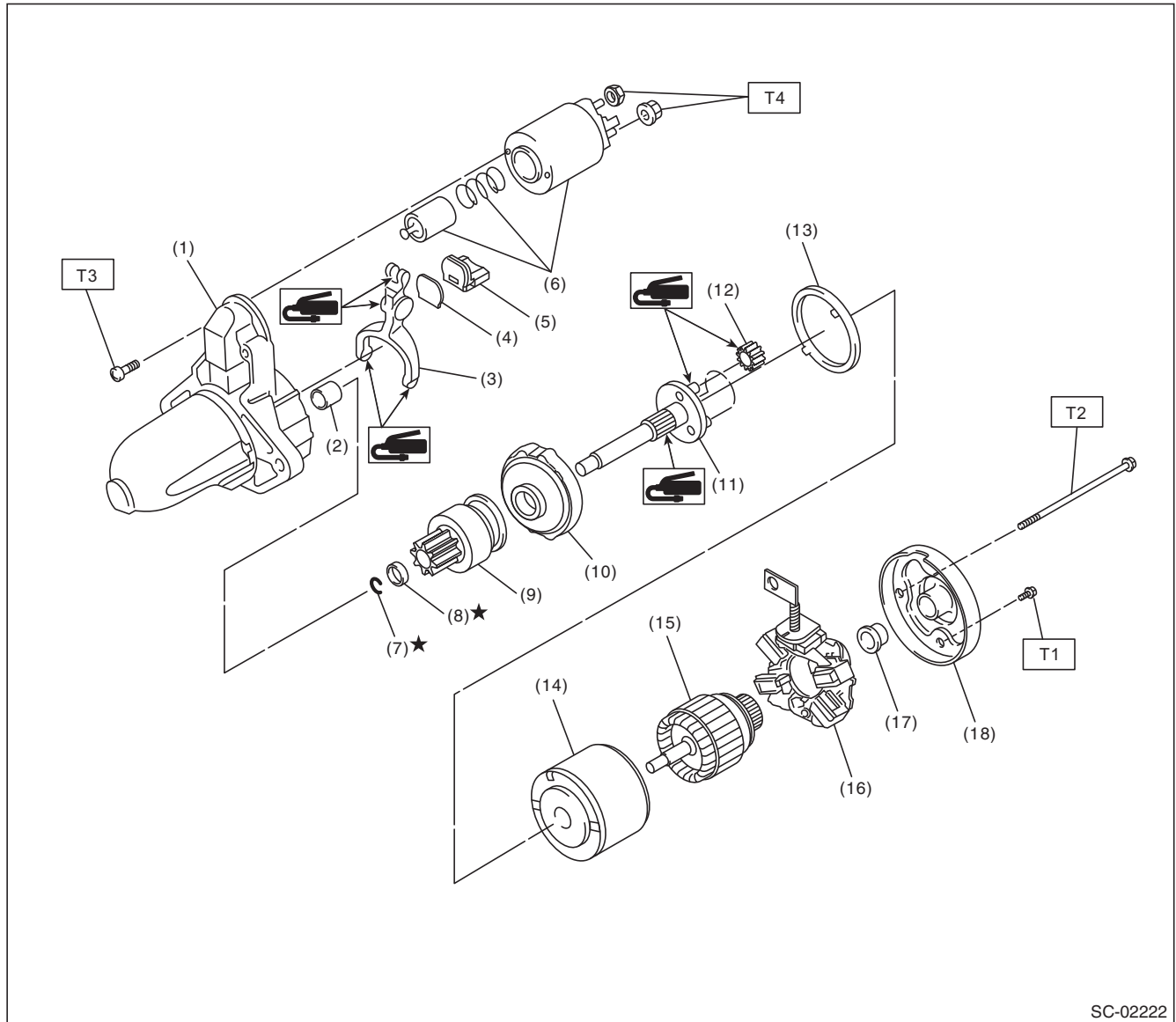
Item			Specifications		
Vehicle model			Non-turbo model		Turbo model
			CVT	MT	
Starter	Type		Reduction type		
	Model		M000T38571	M000T33176	M000T20176
	Manufacturer		Mitsubishi Electric		
	Voltage and output		12 V — 1.2 kW	12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)		
	Number of pinion teeth		9	8	9
	No-load characteristics	Voltage	11 V		
		Current	90 A or less	95 A or less	90 A or less
		Rotating speed	2,370 rpm or more	2,500 rpm or more	2,000 rpm or more
	Load characteristics	Voltage	7.5 V	7.5 V	7.7 V
		Current	300 A	300 A	400 A
		Torque	10.65 N·m (1.1 kgf-m, 7.8 ft-lb) or more	8.84 N·m (0.9 kgf-m, 6.5 ft-lb) or more	16.7 N·m (1.7 kgf-m, 12.3 ft-lb) or more
		Rotating speed	840 rpm or more	870 rpm or more	710 rpm or more
	Lock characteristics	Voltage	4 V	4 V	3.5 V
		Current	780 A or less	680 A or less	960 A or less
		Torque	20 N·m (2.0 kgf-m, 14.8 ft-lb) or more	17 N·m (1.7 kgf-m, 12.5 ft-lb) or more	31 N·m (3.2 kgf-m, 22.9 ft-lb) or more
Generator	Type		Rotating-field three-phase type, voltage regulator built-in type, with load response control system		
	Model		A2TX3381		
	Manufacturer		Mitsubishi Electric		
	Voltage and output		12 V — 130 A		
	Polarity on ground side		Negative		
	Direction of rotation		Clockwise (when observed from pulley side)		
	Stator connection		3-phase $\triangle$ type		
	Output current		1,500 rpm — 50 A or more 2,500 rpm — 111 A or more 5,000 rpm — 133 A or more		
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]		
	Rotor slip ring outer diameter	Standard	22.7 mm (0.894 in)		
		Limit	22.1 mm (0.870 in)		
	Brush length	Standard	22.5 mm (0.886 in)		
		Limit	5.0 mm (0.197 in)		
Battery	Type and capacity		12 V — 48 AH (55D 23L)		

General Description

STARTING/CHARGING SYSTEMS

B: COMPONENT

1. STARTER



SC-02222

- | | | |
|--------------------------|-------------------------|-------------------------|
| (1) Starter housing ASSY | (9) Overrunning clutch | (17) Sleeve bearing |
| (2) Sleeve bearing | (10) Internal gear ASSY | (18) Starter cover ASSY |
| (3) Shift lever | (11) Shaft | |
| (4) Plate | (12) Pinion gear | |
| (5) Seal rubber | (13) Seal rubber | |
| (6) Magnet switch ASSY | (14) Yoke ASSY | |
| (7) Snap ring | (15) Armature ASSY | |
| (8) Stopper | (16) Brush holder ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.4 (0.1, 1.0)

T2: 6 (0.6, 4.4)

T3: 7.5 (0.8, 5.5)

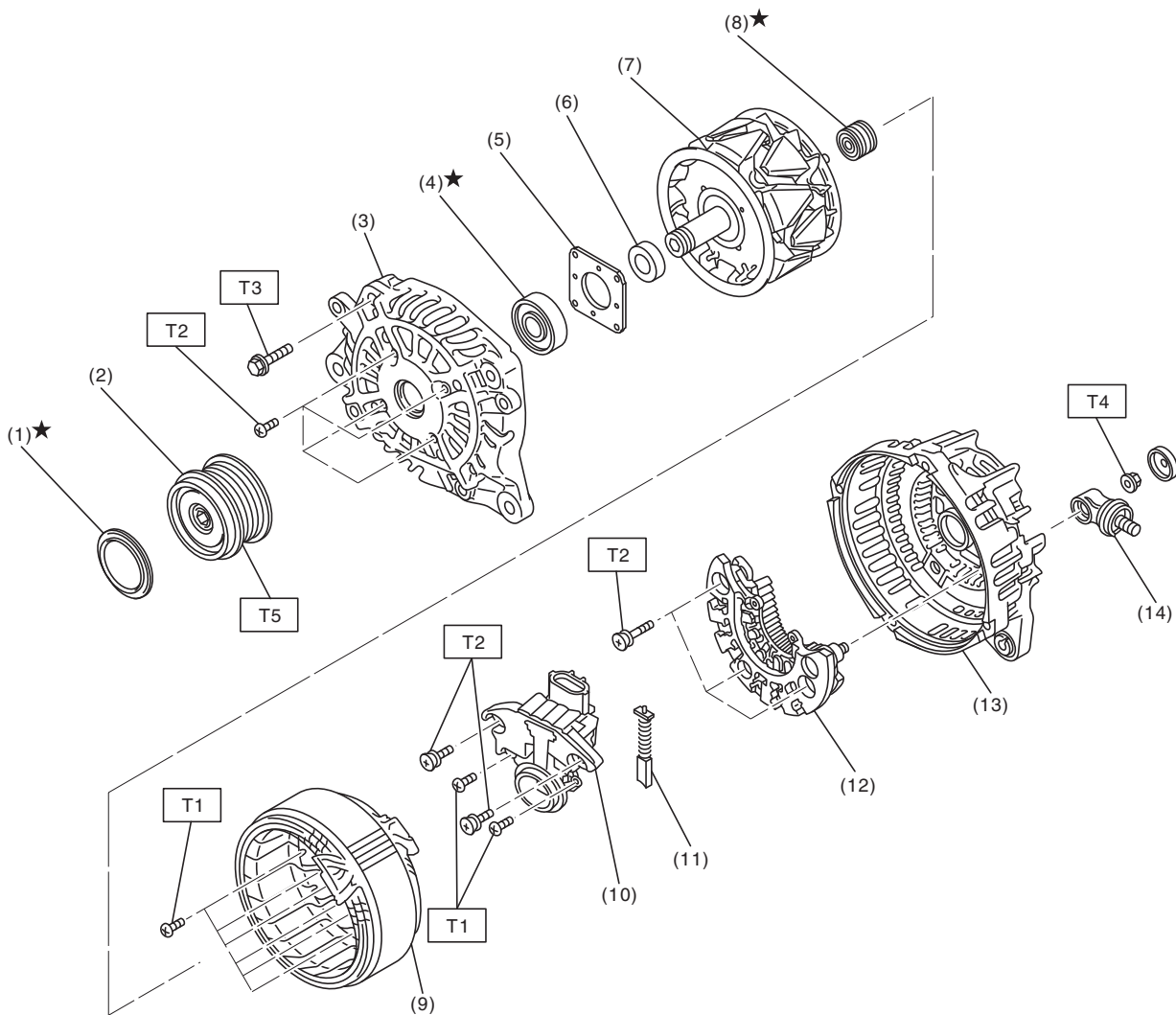
T4: 10 (1.0, 7.4)

SC(H4DO)-3

General Description

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2. GENERATOR



SC-02884

- | | |
|----------------------|-------------------|
| (1) Cap | (8) Bearing |
| (2) Pulley | (9) Stator coil |
| (3) Front cover | (10) IC regulator |
| (4) Ball bearing | (11) Brush |
| (5) Bearing retainer | (12) Rectifier |
| (6) Spacer | (13) Rear cover |
| (7) Rotor | (14) Terminal B |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 2 (0.2, 1.5)

T2: 3.9 (0.4, 2.9)

T3: 4.4 (0.4, 3.2)

T4: 8.9 (0.9, 6.6)

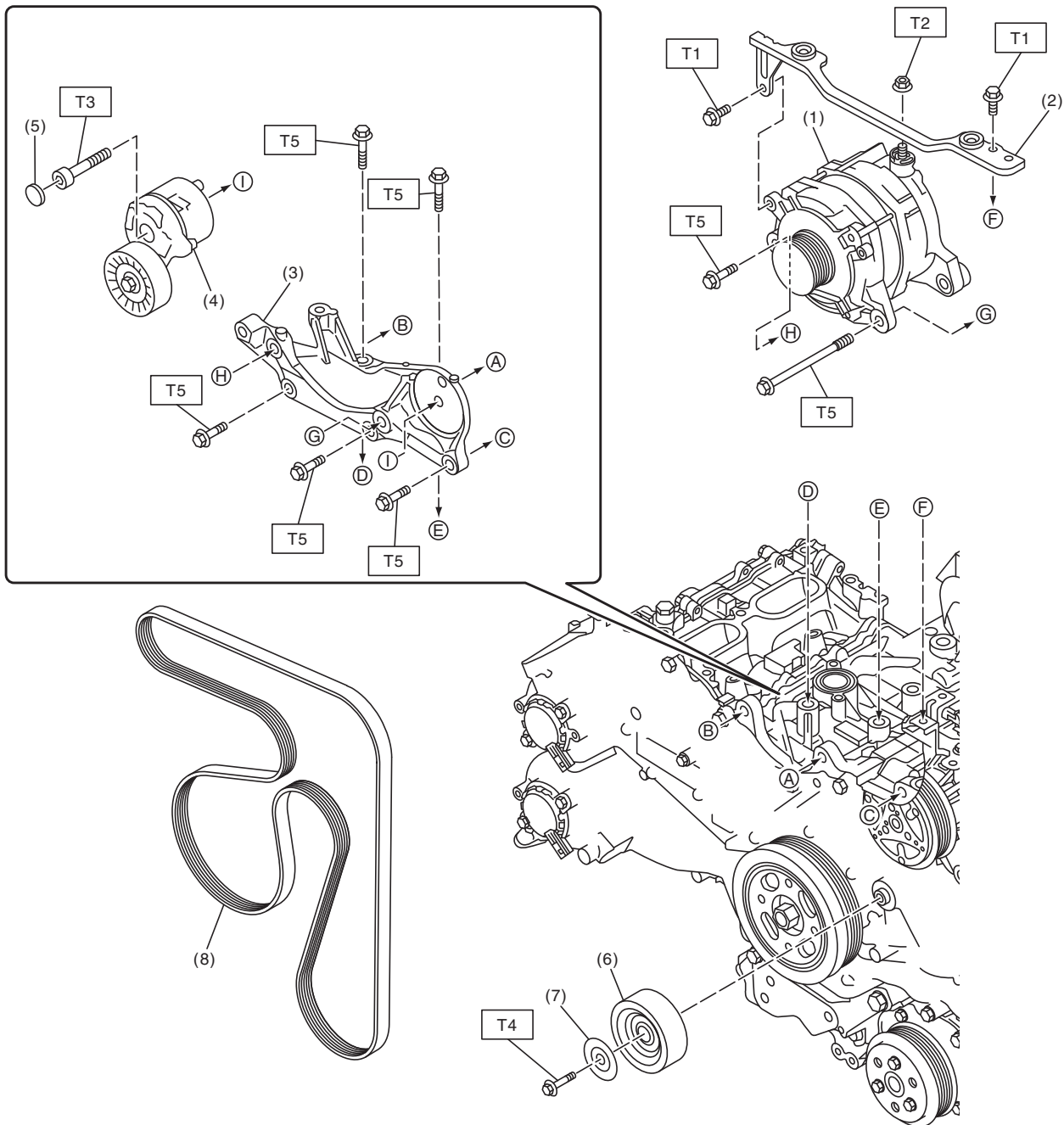
T5: 108 (11.0, 79.8)

SC(H4DO)-4

General Description

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3. GENERATOR BRACKET



SC-02932

- | | |
|-----------------------------|------------------------|
| (1) Generator | (6) Idler pulley |
| (2) Collector cover bracket | (7) Idler pulley cover |
| (3) Generator bracket | (8) V-belt |
| (4) V-belt tensioner ASSY | |
| (5) Cap | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)

T2: 16 (1.6, 11.8)

T3: 25 (2.5, 18.4)

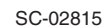
T4: 36 (3.7, 26.6)

T5: <Ref. to SC(H4DO)-42, INSTALLATION, Generator.>

SC(H4DO)-5



4. BATTERY CURRENT & TEMPERATURE SENSOR



- T3: 14 (1.4, 10.3)**

General Description

STARTING/CHARGING SYSTEMS

C: CAUTION

- Prior to starting work, pay special attention to the following:
 1. Always wear work clothes, a safety cap, protective shoes. Additionally, wear a helmet, protective goggles, etc. if necessary.
 2. Protect the vehicle using a seat cover, fender cover, etc.
 3. Prepare the service tools, clean cloth, containers to catch grease and oil, etc.
- Vehicle components are extremely hot immediately after driving. Be wary of receiving burns from heated parts.
- When performing a repair, identify the cause of trouble and avoid unnecessary removal, disassembly and replacement.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Always use the jack-up point when the shop jacks or rigid racks are used to support the vehicle.
- Remove contamination including dirt and corrosion before removal, installation, disassembly or assembly.
- Keep the removed parts in order and protect them from dust and dirt.
- All removed parts, if to be reused, should be reinstalled in the original positions with attention to the correct directions, etc.
- Bolts, nuts and washers should be replaced with new parts as required.
- Be sure to tighten the fasteners including bolts and nuts to the specified torque.

D: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.



Starter

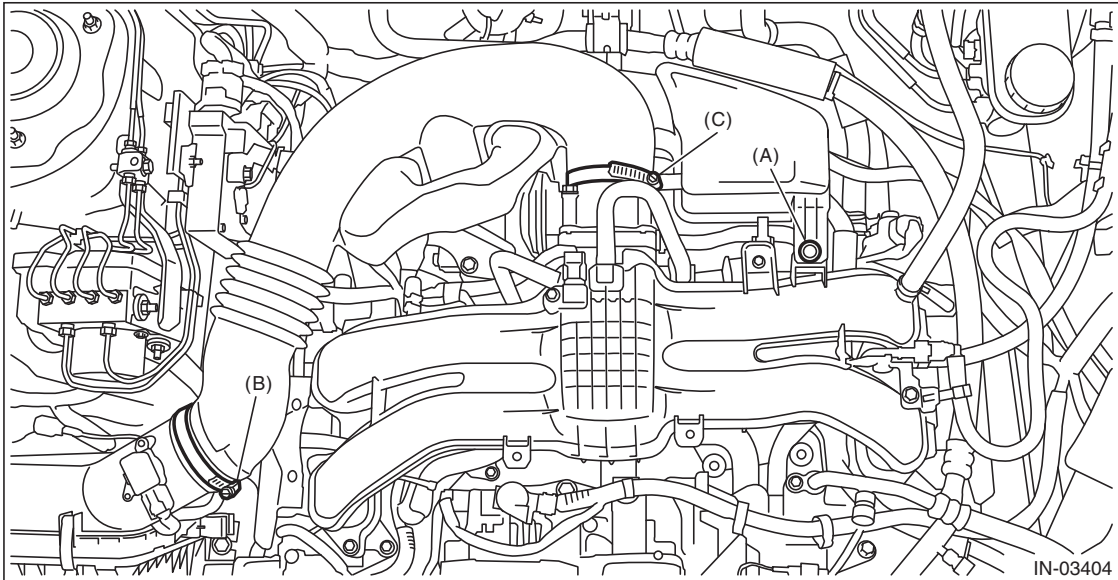
STARTING/CHARGING SYSTEMS

2. Starter

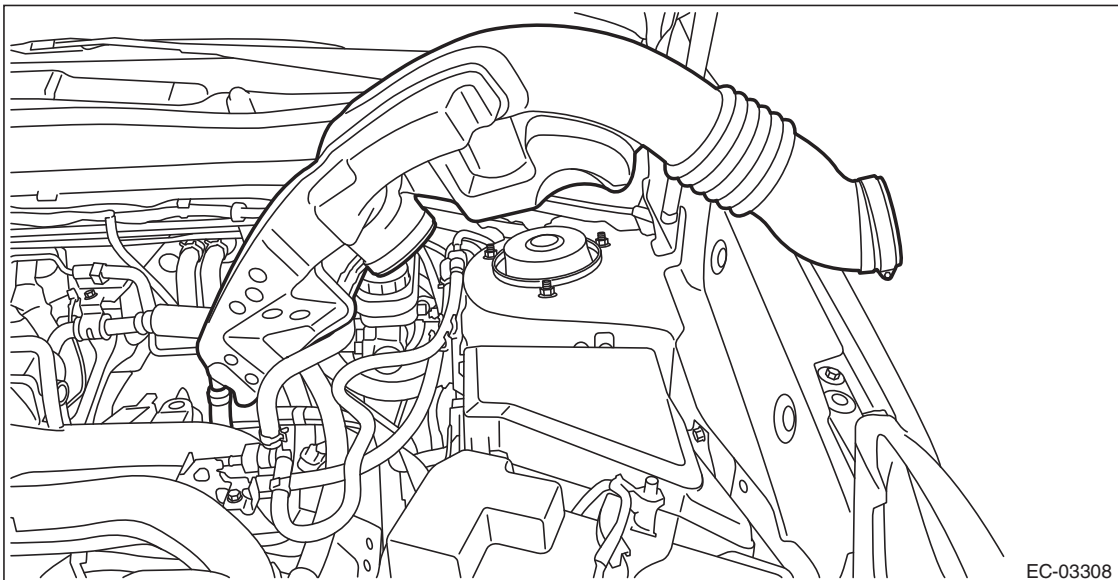
A: REMOVAL

1. NON-TURBO MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the clip (A) from the air intake boot.
- 3) Loosen the clamp (B) securing the air cleaner case (rear) to the air intake boot.
- 4) Loosen the clamp (C) which secures the throttle body to the air intake boot.



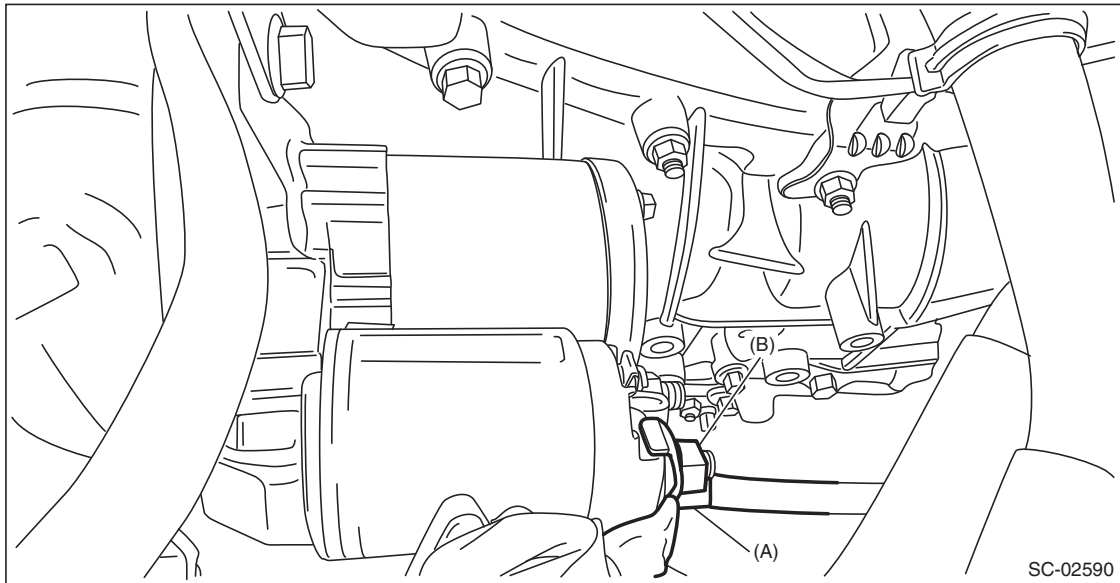
- 5) Remove the air intake boot from the throttle body, and move it to the left side wheel apron.



Starter

STARTING/CHARGING SYSTEMS

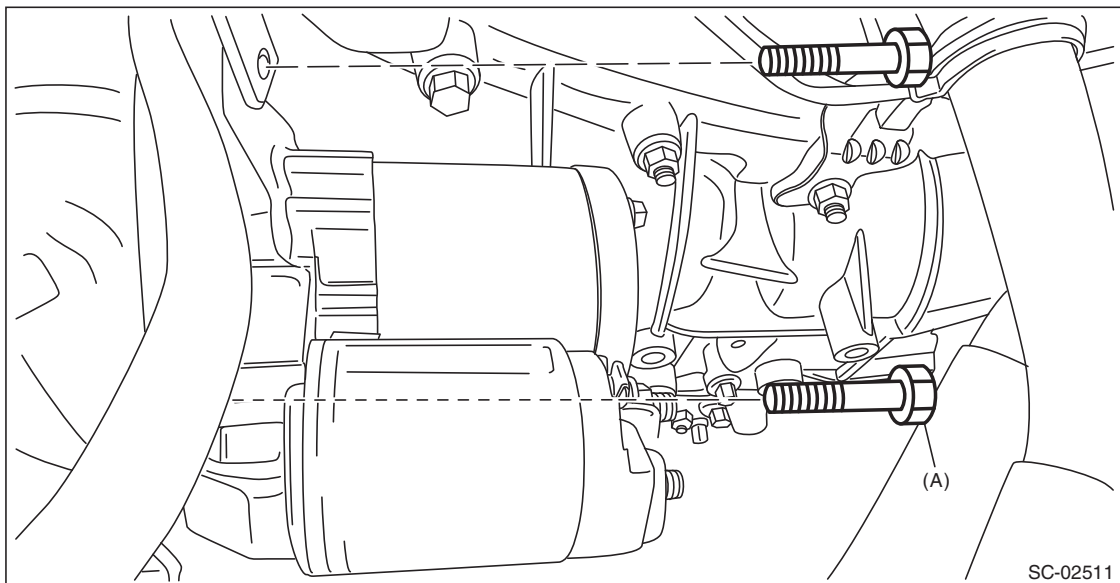
6) Disconnect the connector (A) and terminal (B) from starter.



7) Remove the bolt and nut which secure the starter.

NOTE:

For CVT model, a nut is used at (A).



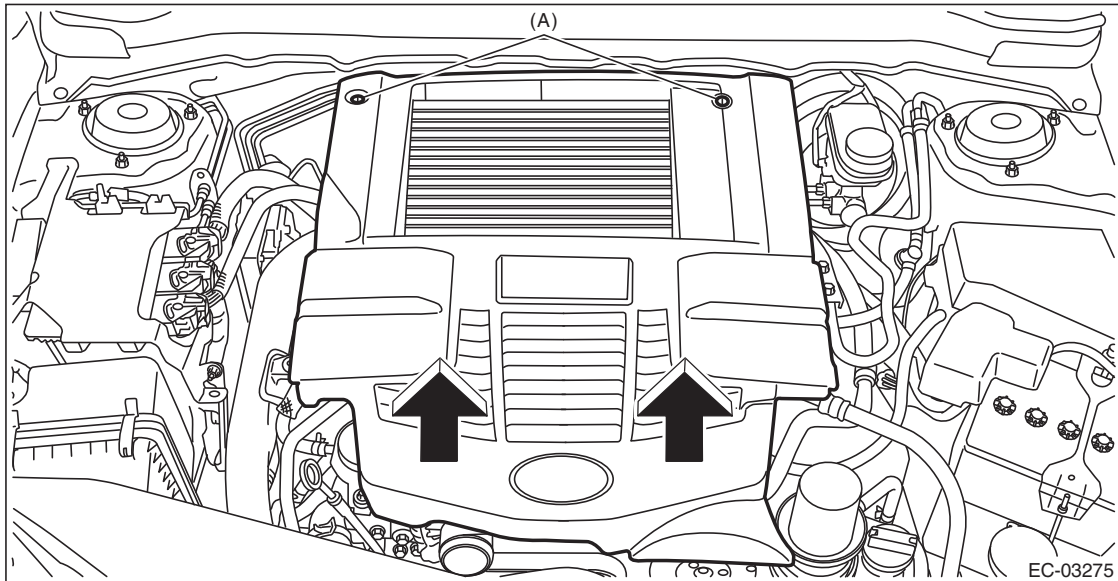
8) Remove the starter from transmission.

Starter

STARTING/CHARGING SYSTEMS

2. TURBO MODEL

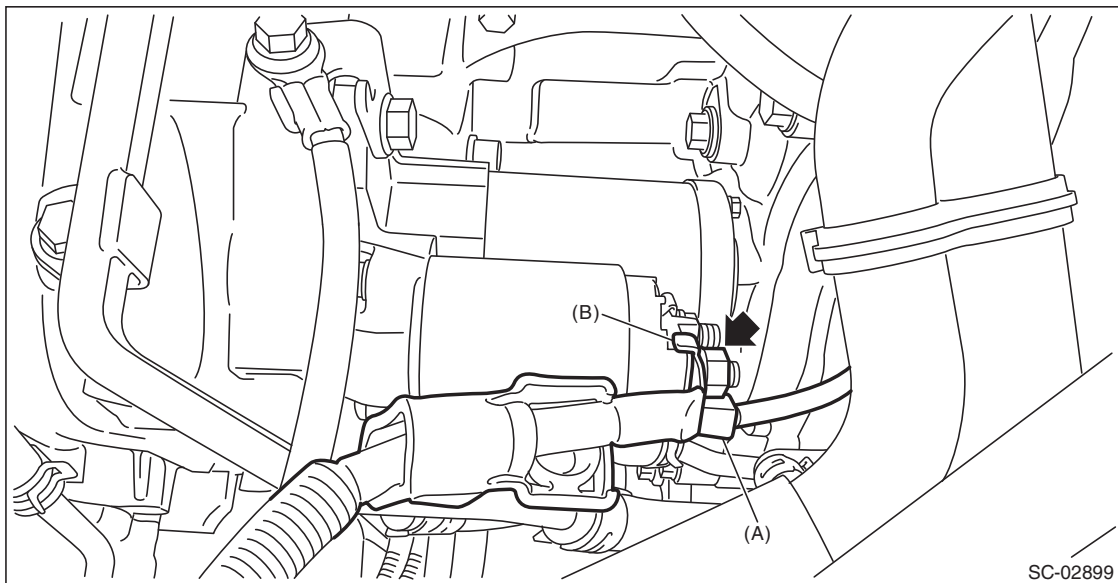
1) Remove the clip (A), lift the front of the collector cover in the direction of arrow, and then remove the collector cover.



2) Disconnect the ground cable from battery.

3) Remove the intercooler. <Ref. to IN(H4DOTC)-35, REMOVAL, Intercooler.>

4) Disconnect the connector (A) and terminal (B) from starter.

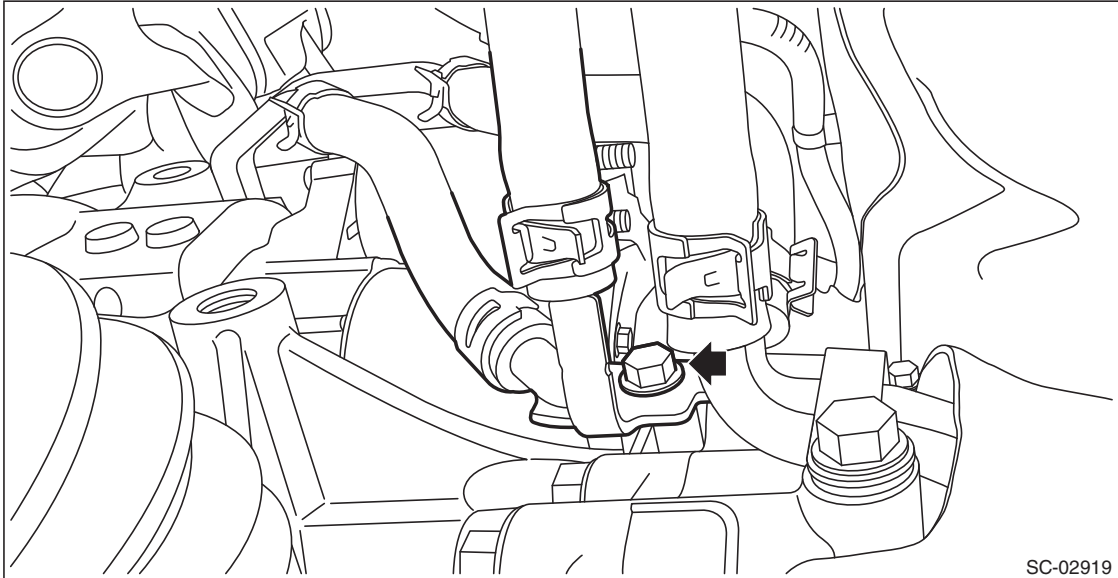


5) Lift up the vehicle.

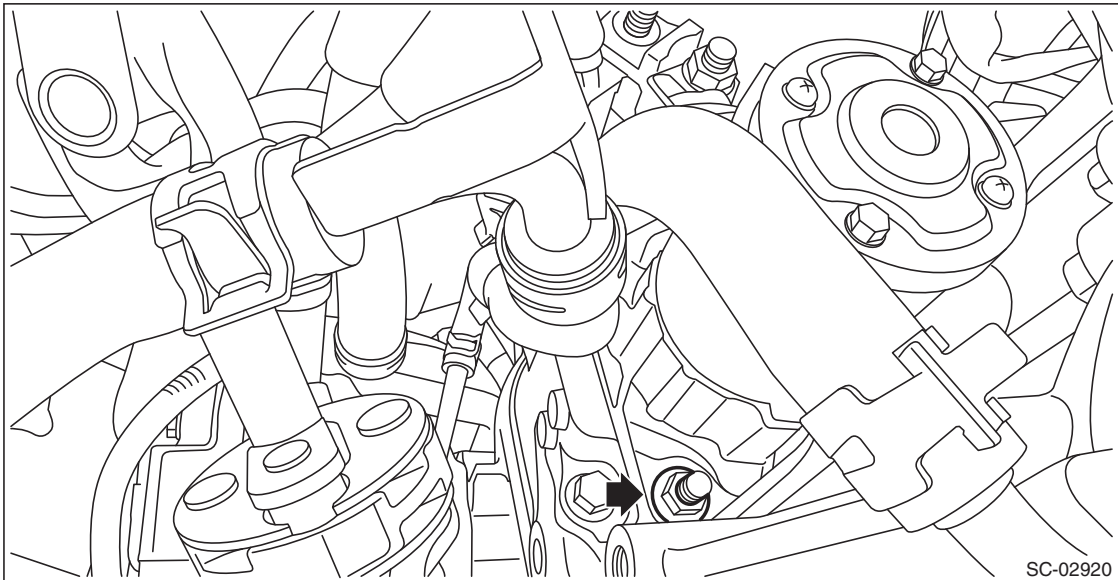
Starter

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- 6) Remove the bolt which secures the CVTF cooler pipe to the transmission, and move the CVTF cooler pipe to the left side of the transmission.



- 7) Remove the nut at the bottom of the starter.

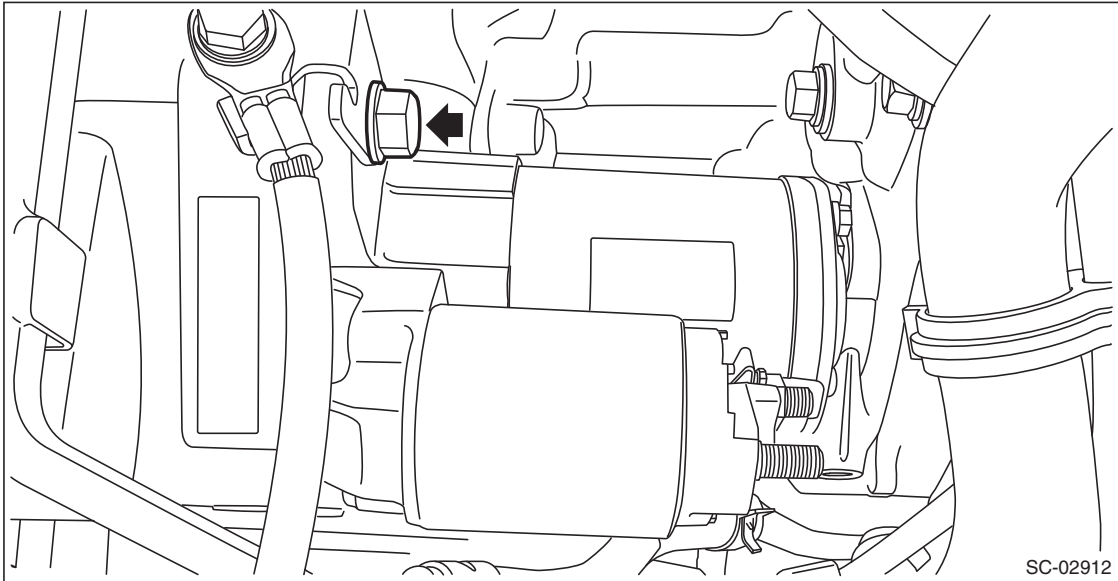


- 8) Lower the vehicle.

Starter

STARTING/CHARGING SYSTEMS

9) Remove the bolt at the top of the starter and remove the starter from the transmission.



B: INSTALLATION

1. NON-TURBO MODEL

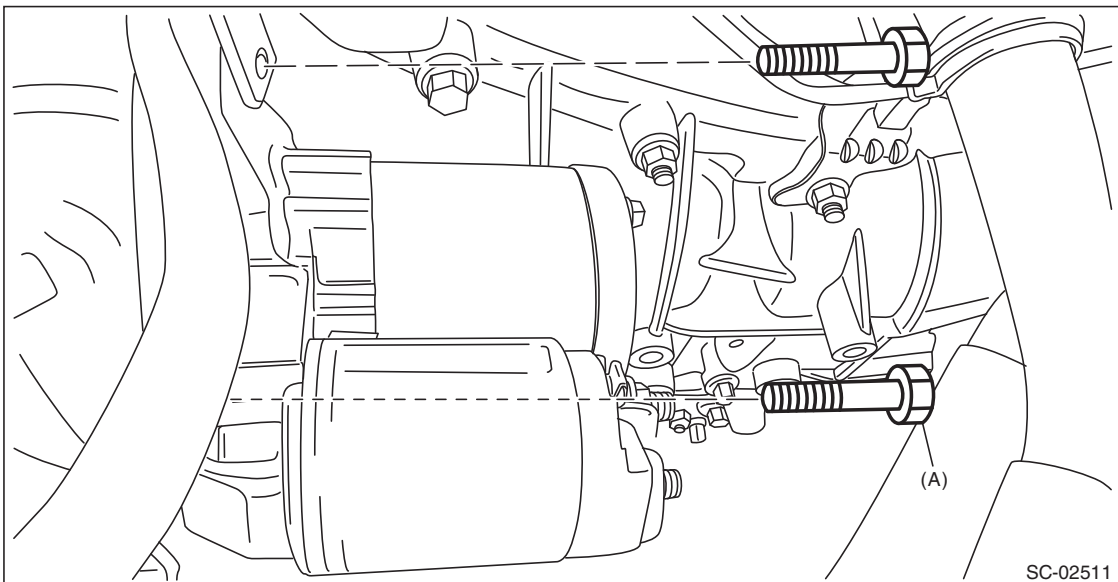
Install in the reverse order of removal.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

NOTE:

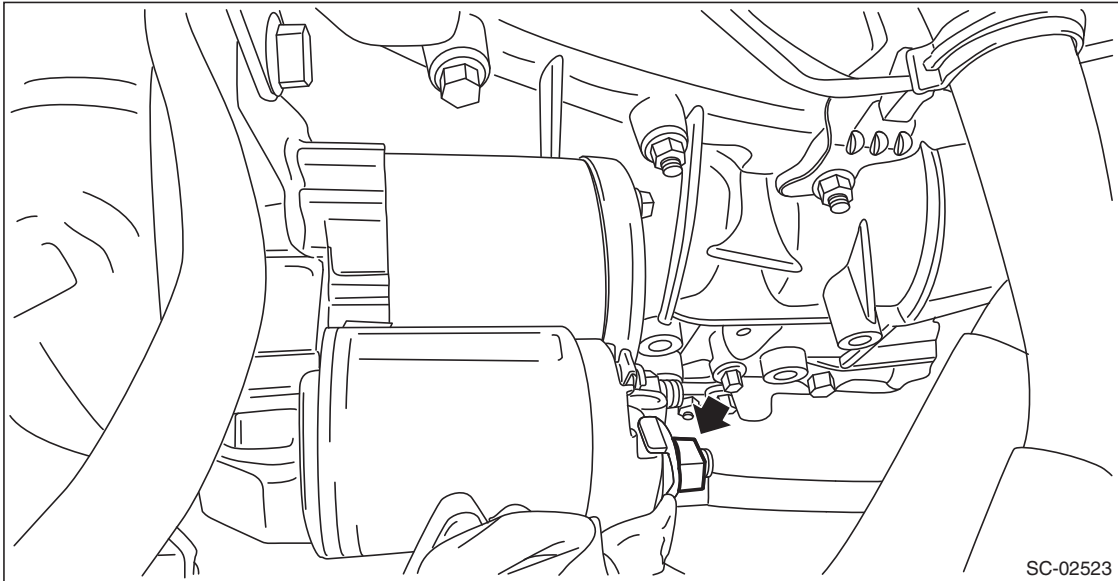
For CVT model, a nut is used at (A).



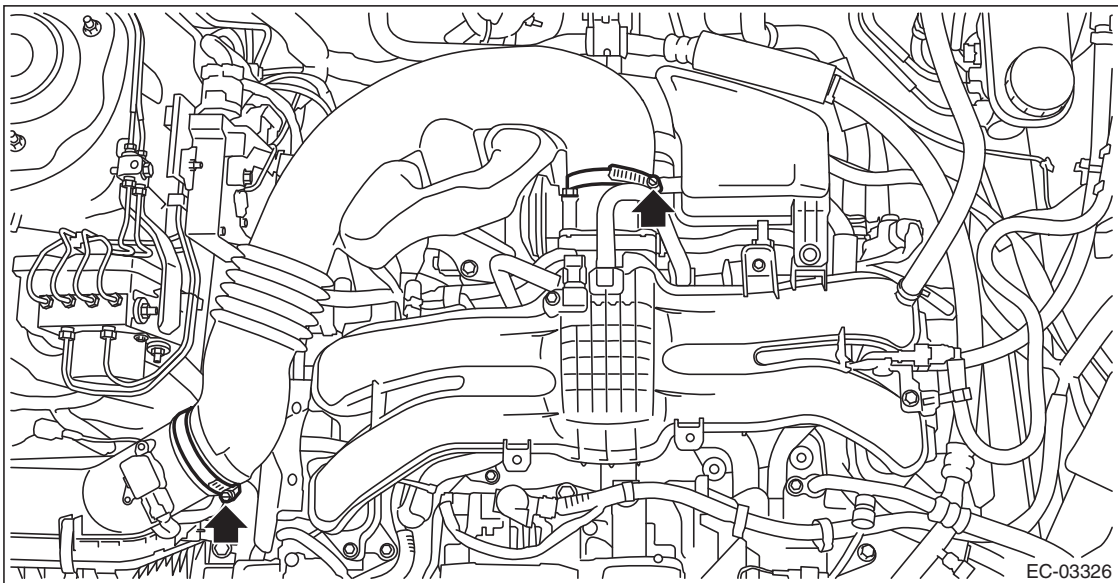
Starter

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Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



Starter

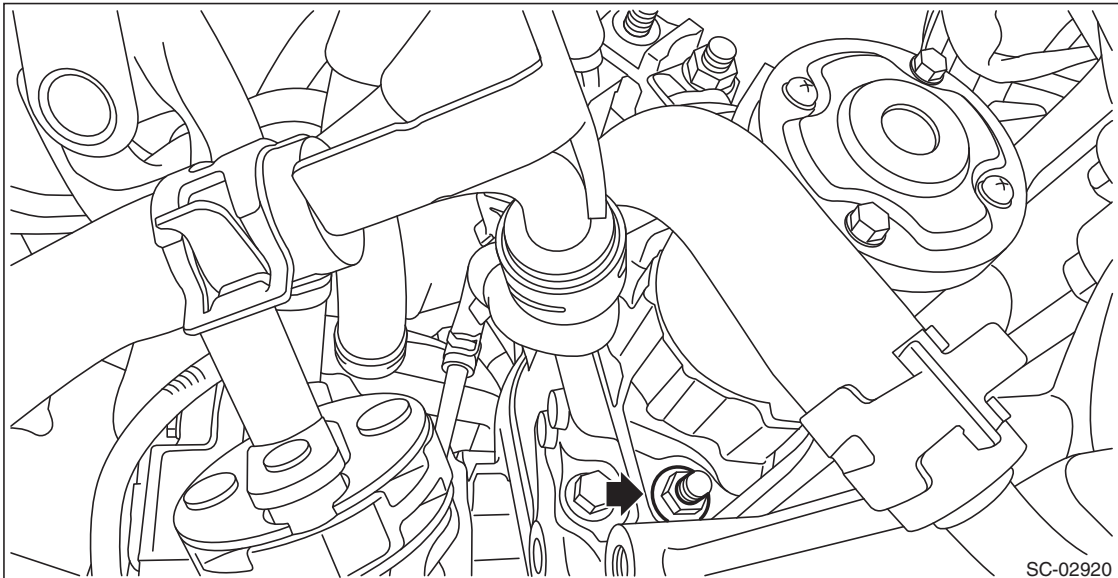
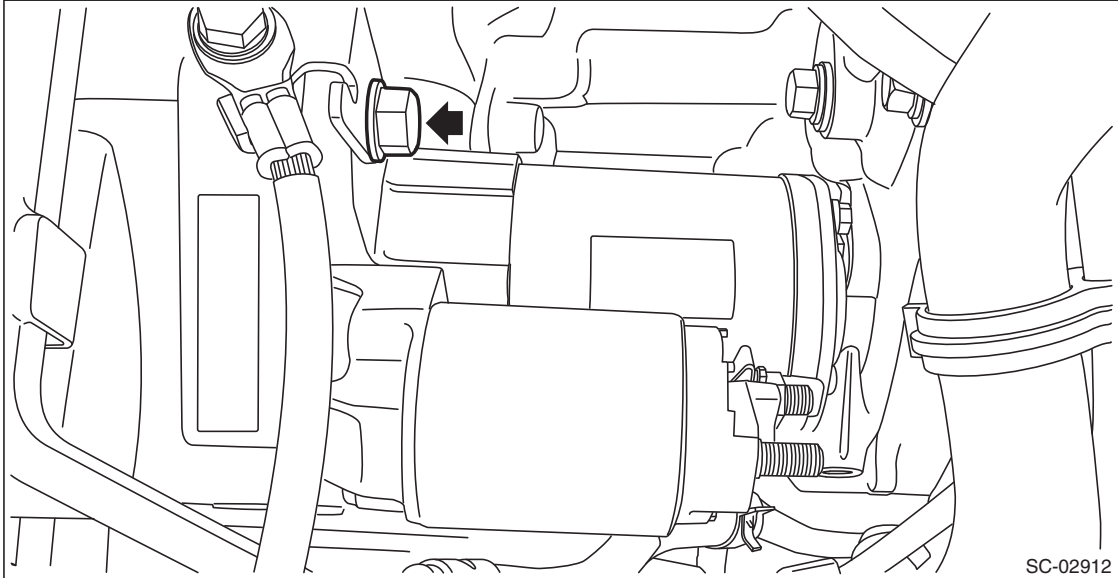
STARTING/CHARGING SYSTEMS

2. TURBO MODEL

Install in the reverse order of removal.

Tightening torque:

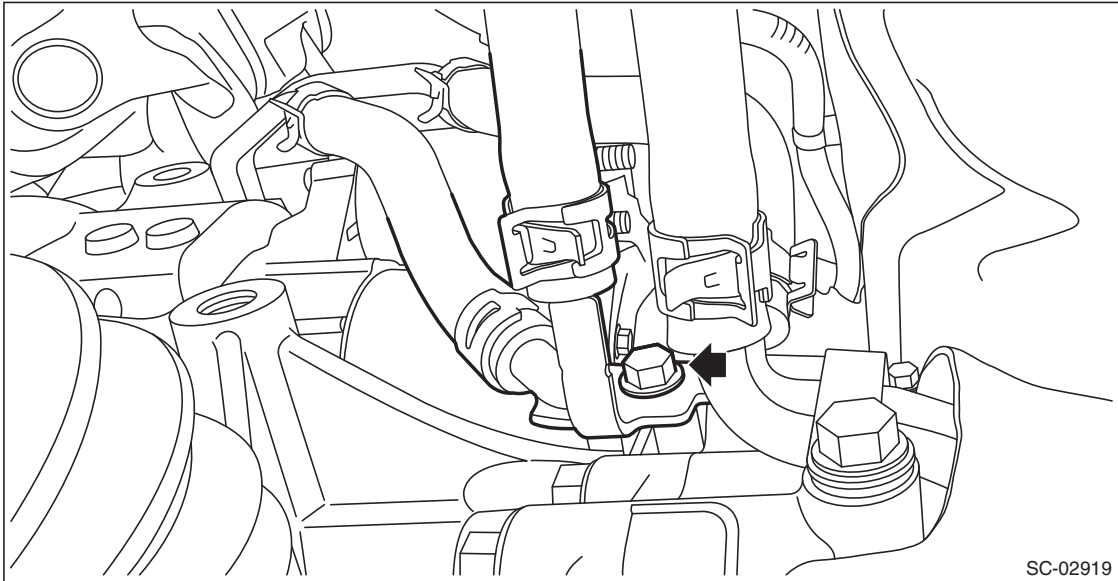
50 N·m (5.1 kgf-m, 36.9 ft-lb)



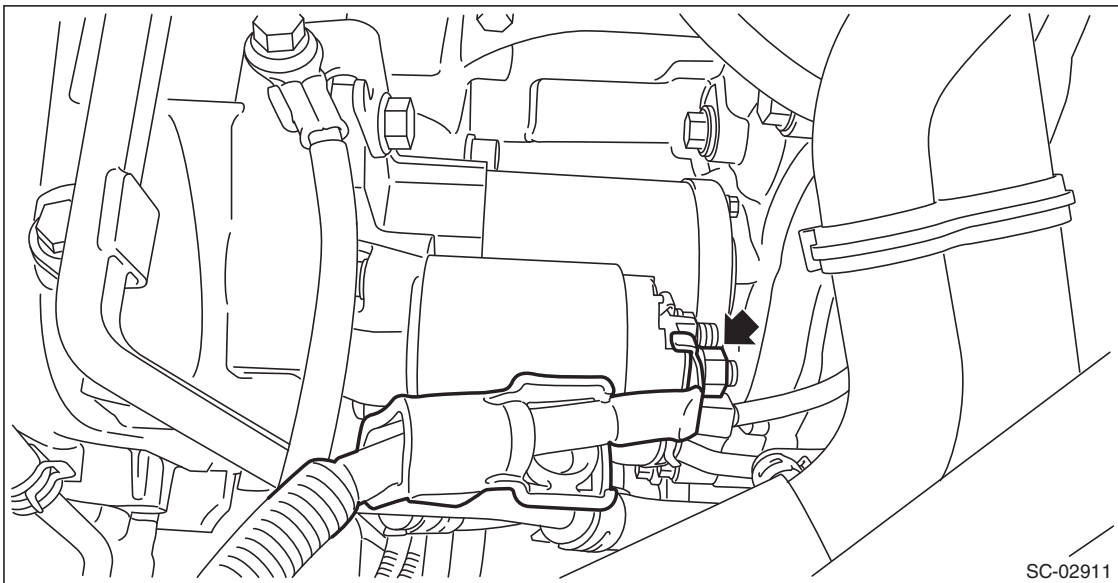
Starter

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Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

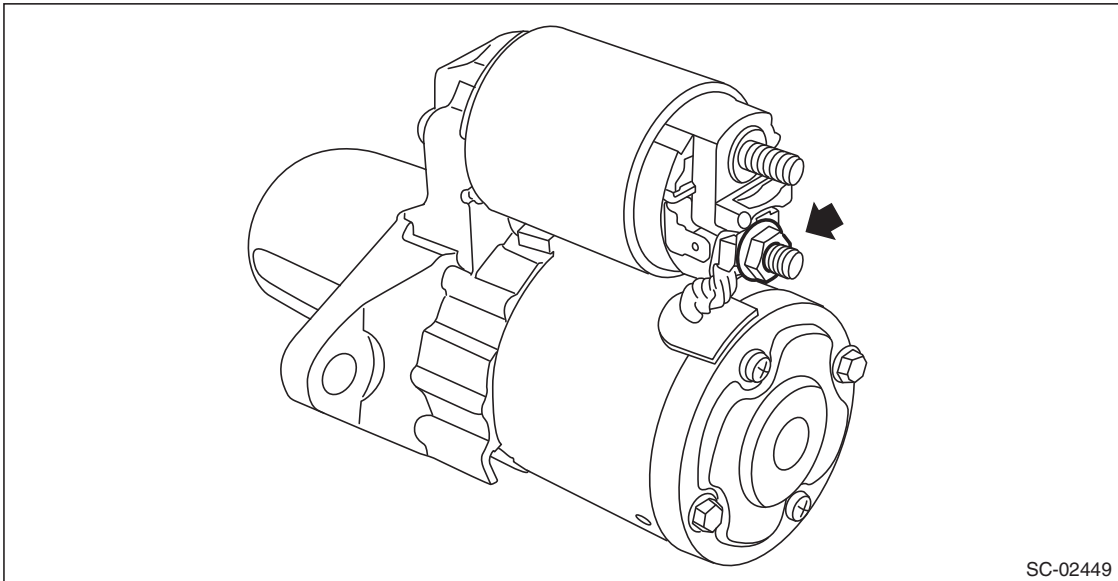


Starter

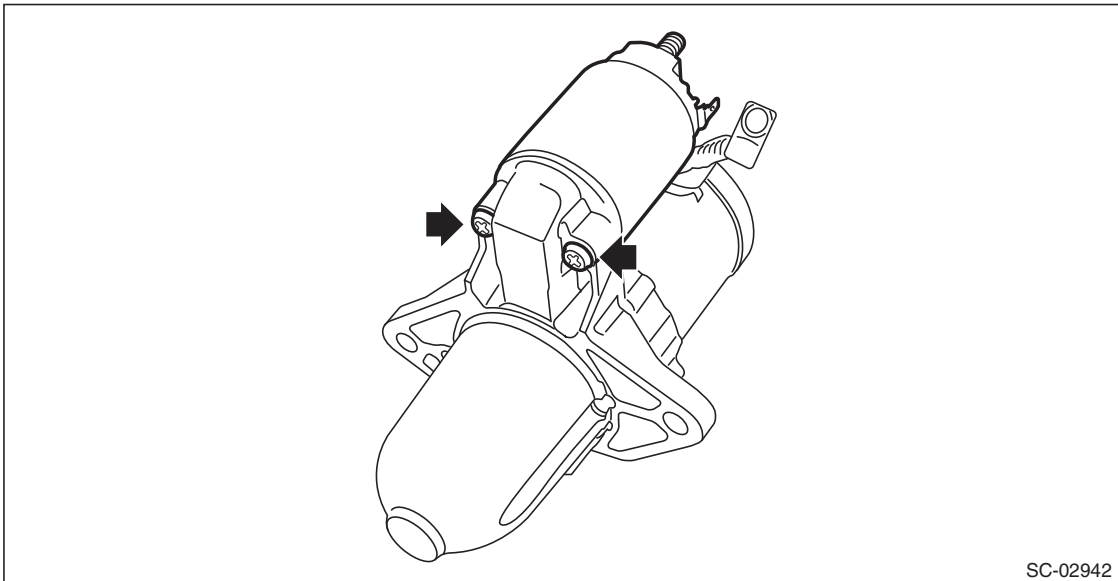
STARTING/CHARGING SYSTEMS

C: DISASSEMBLY

- 1) Disconnect the terminal M from the magnet switch assembly.



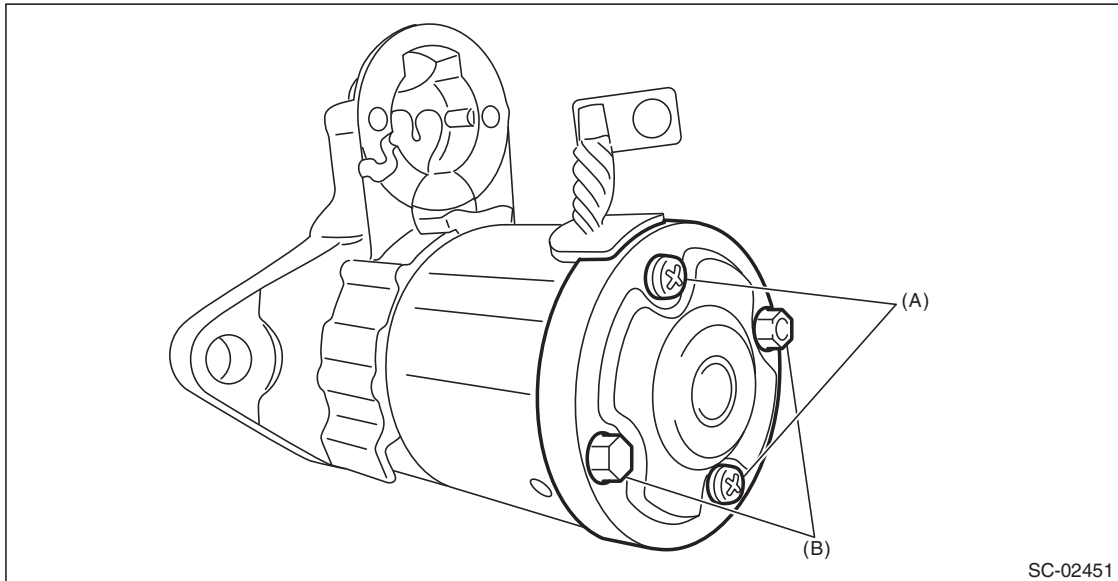
- 2) Remove the magnet switch assembly from the starter housing assembly.



Starter

STARTING/CHARGING SYSTEMS

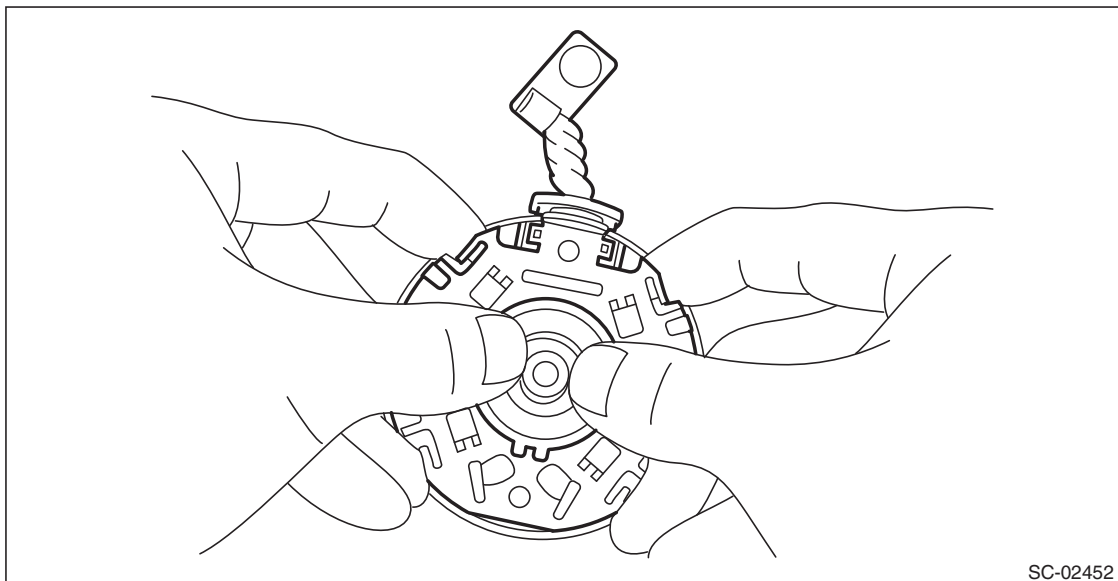
3) Remove screws (A) of the brush holder assembly, and through bolts (B) on both sides, and remove the starter cover assembly.



4) Remove the brush holder assembly from the armature assembly.

NOTE:

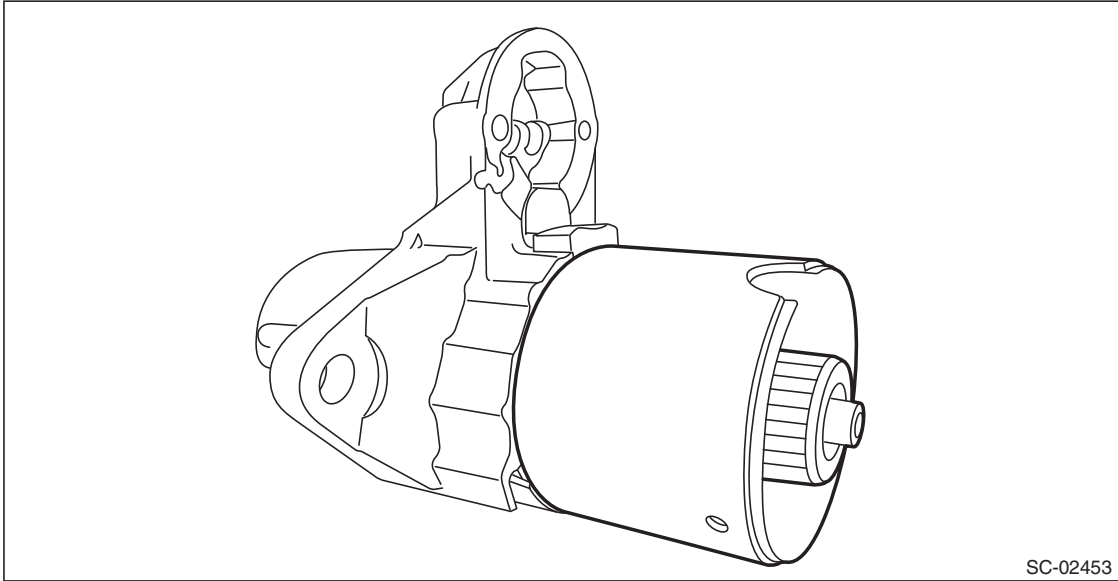
Hold the brush with your fingers so that the brush spring does not come flying out.



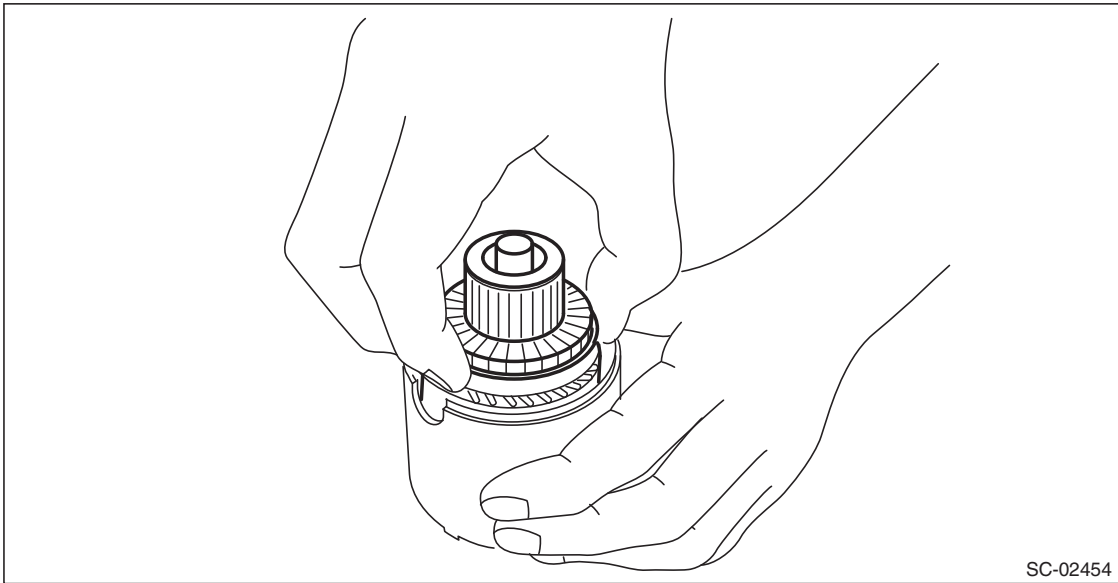
Starter

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5) Remove the armature assembly and yoke assembly from the starter housing assembly together as a single unit.



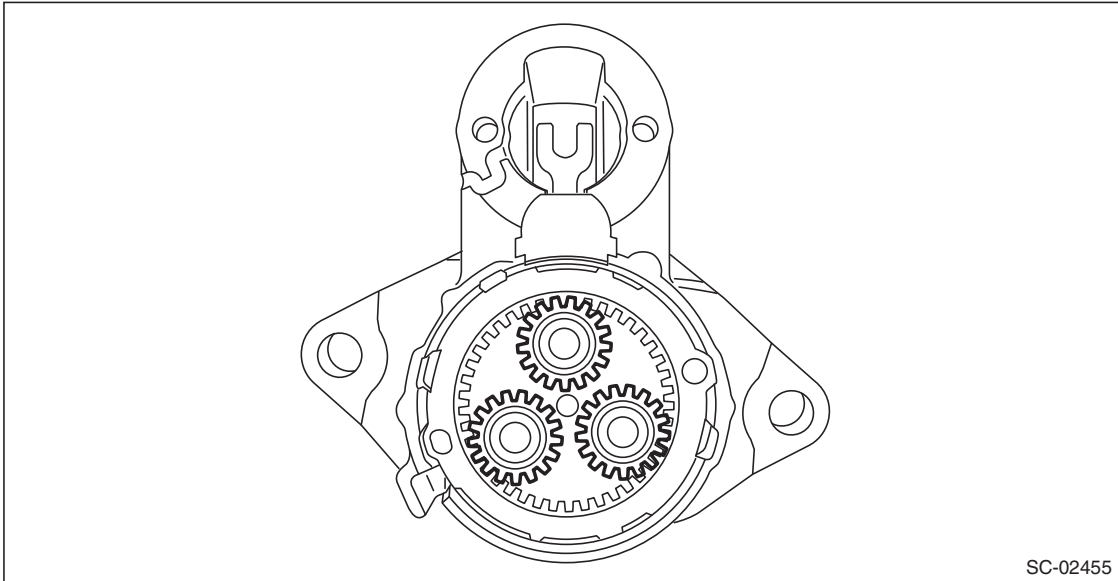
6) Separate the armature assembly and yoke assembly.



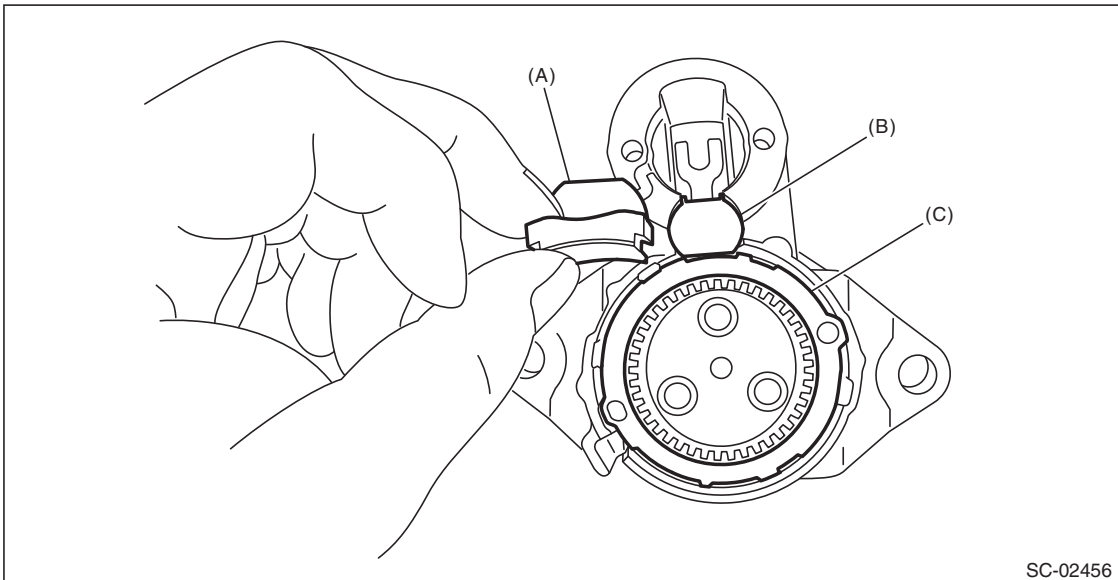
Starter

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- 7) Remove the pinion gear from the internal gear assembly.



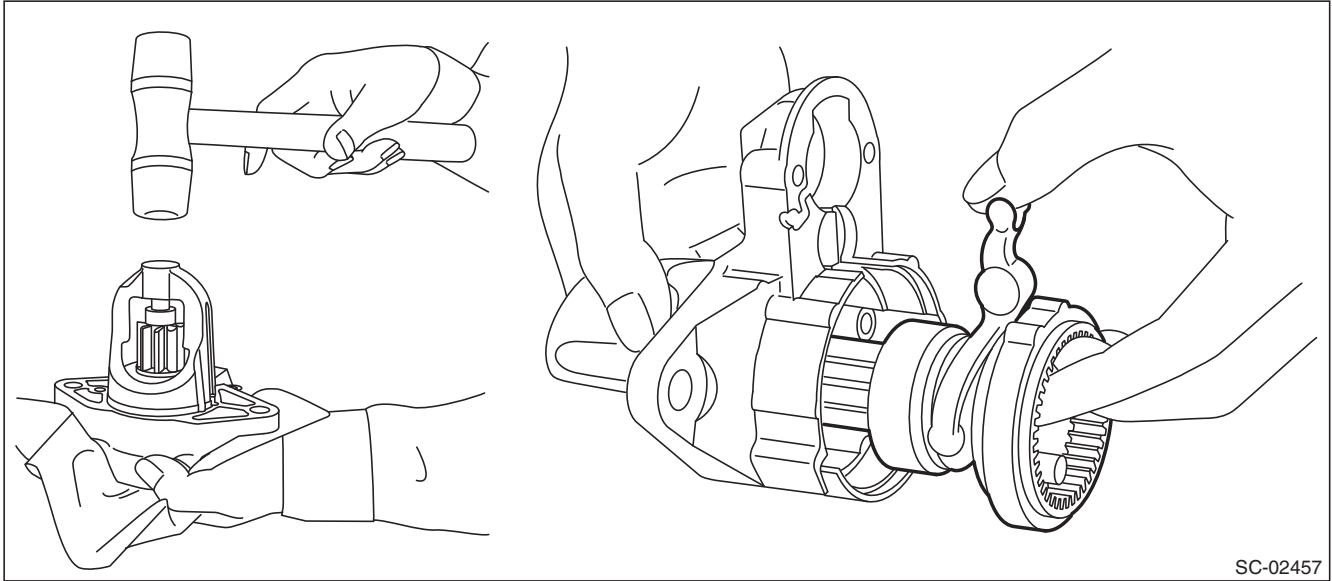
- 8) Remove seal rubber (A), plate (B), and seal rubber (C).



Starter

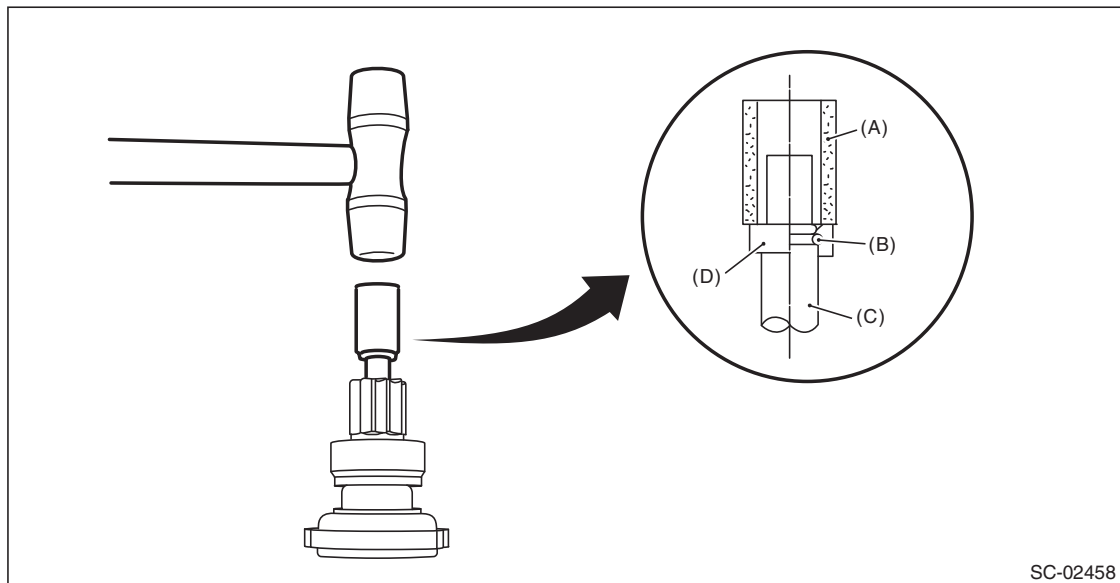
STARTING/CHARGING SYSTEMS

9) Lightly tap the starter housing assembly with a plastic hammer as shown in the figure, and remove the overrunning clutch, internal gear assembly, shaft and shift lever together as one unit.



10) Use the following procedures to remove the overrunning clutch from the shaft.

(1) Use an appropriate tool (such as a fit socket wrench), and remove the stopper from snap ring by lightly tapping the stopper with a plastic hammer.



(A) Appropriate tool

(B) Snap ring

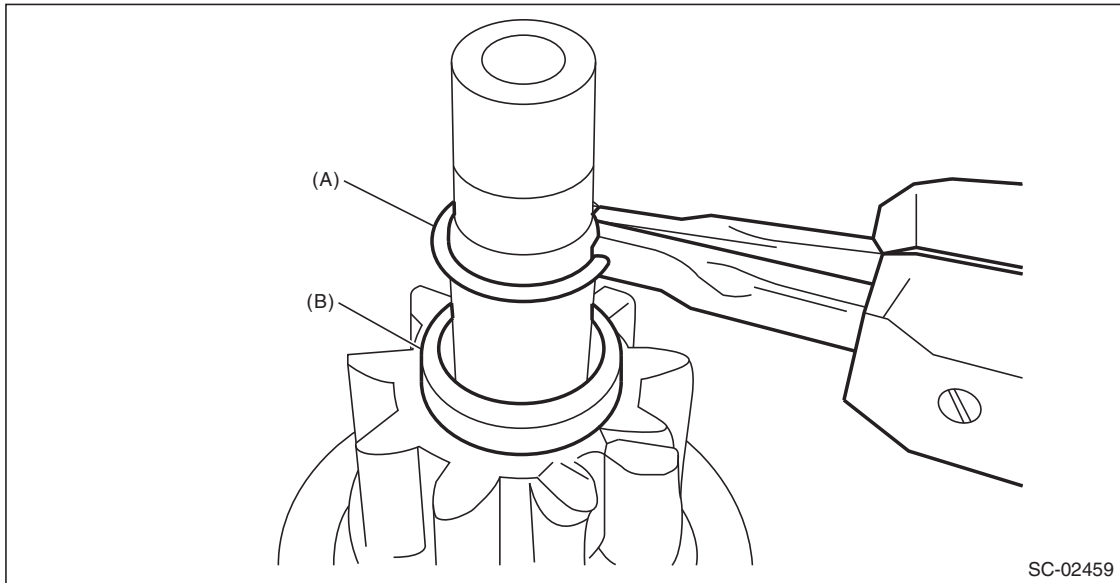
(C) Shaft

(D) Stopper

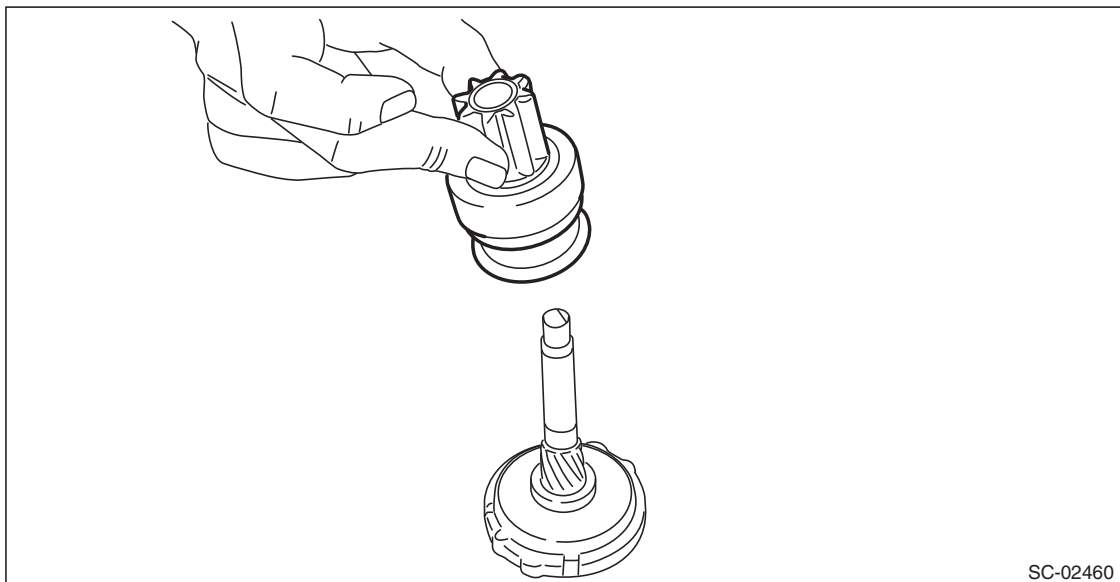
Starter

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- (2) Remove snap ring (A) from the shaft, and remove stopper (B).



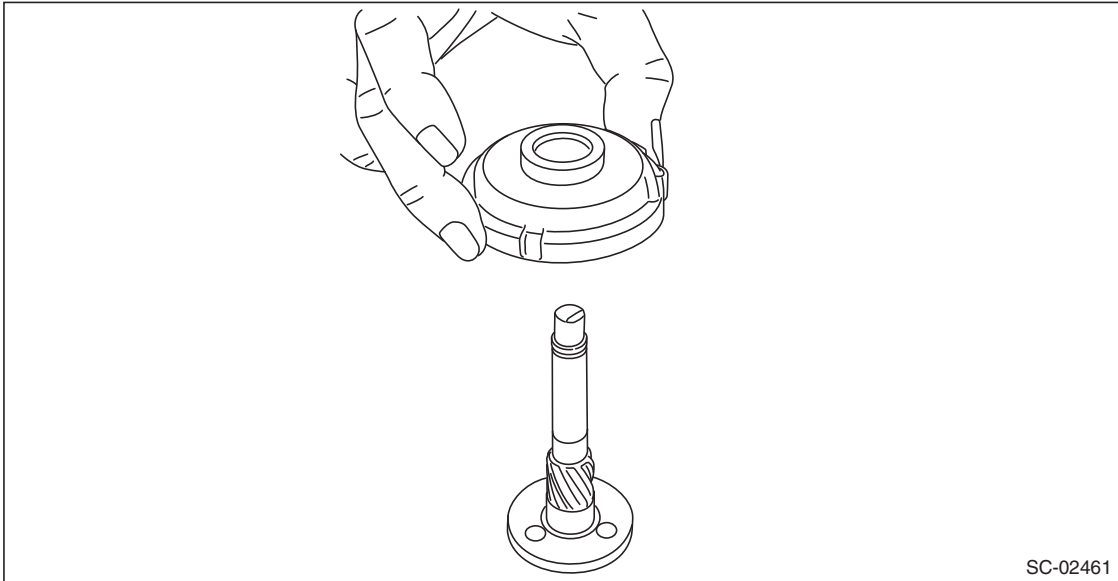
- (3) Remove the overrunning clutch from the shaft.



Starter

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- 11) Separate the internal gear assembly and shaft.



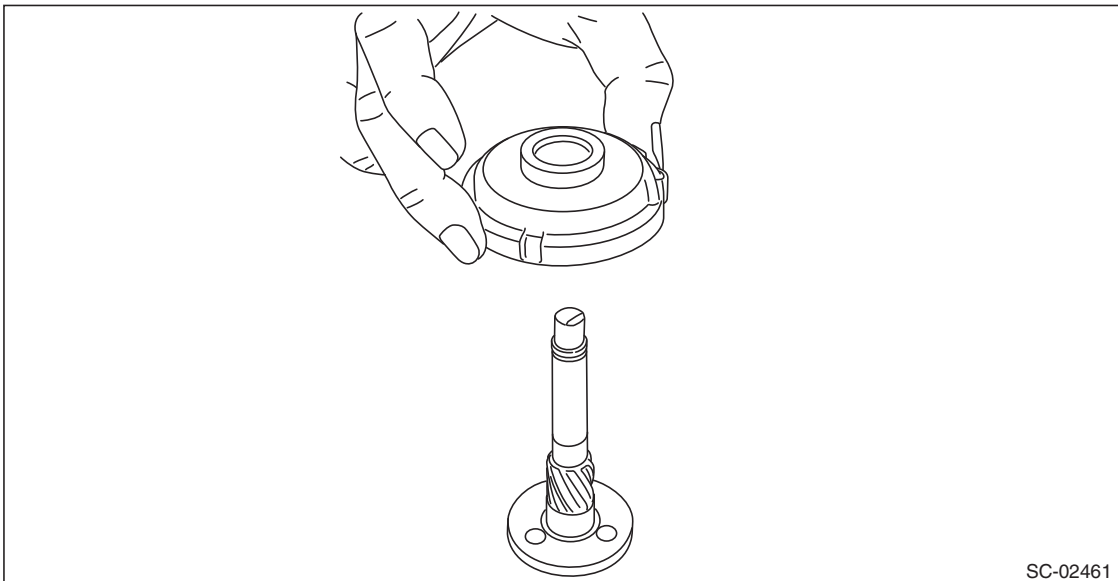
D: ASSEMBLY

- 1) Apply grease to the shaft sliding surfaces of the internal gear assembly.

Grease:

Multemp #6129 or equivalent

- 2) Assemble the shaft to the internal gear assembly.



Starter

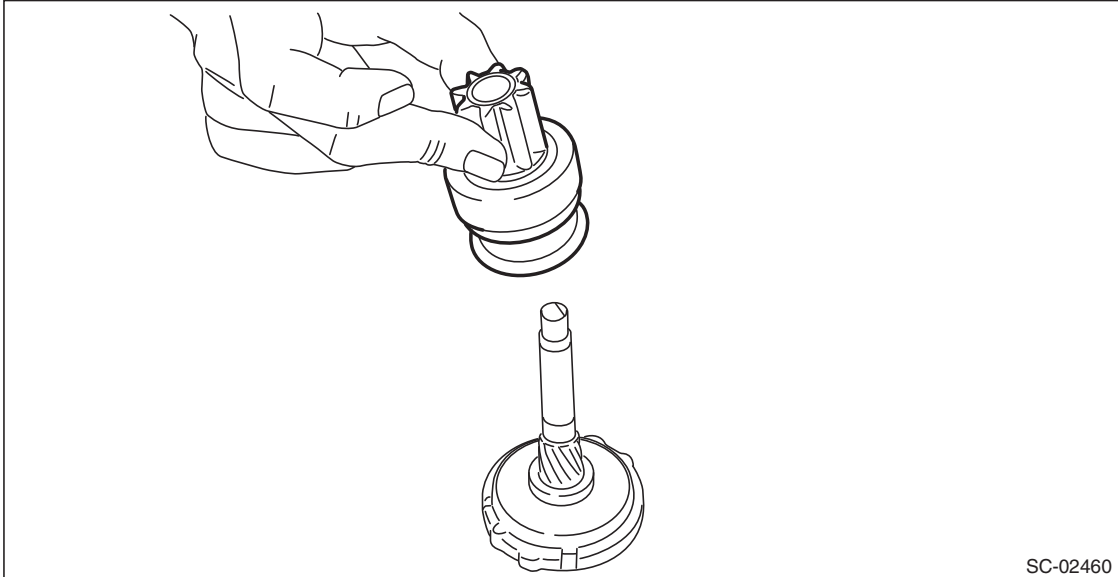
STARTING/CHARGING SYSTEMS

- 3) Assemble the overrunning clutch as follows:
(1) Apply grease to the spline portion of the shaft.

Grease:

Multip #6129 or equivalent

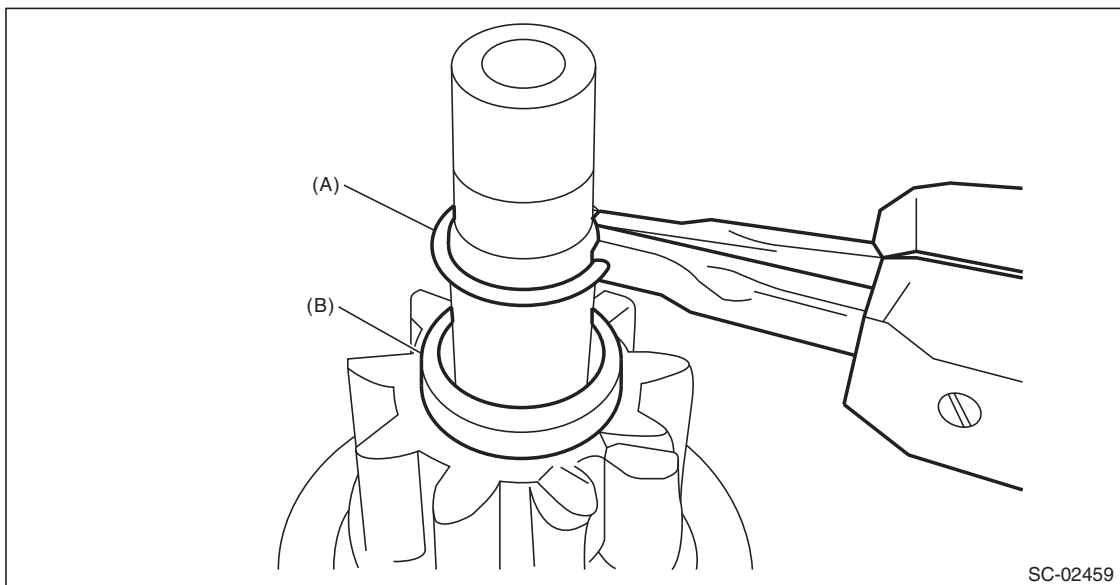
- (2) Install the overrunning clutch to shaft.



- (3) Pass stopper (B) through the shaft assembly, and attach snap ring (A).

NOTE:

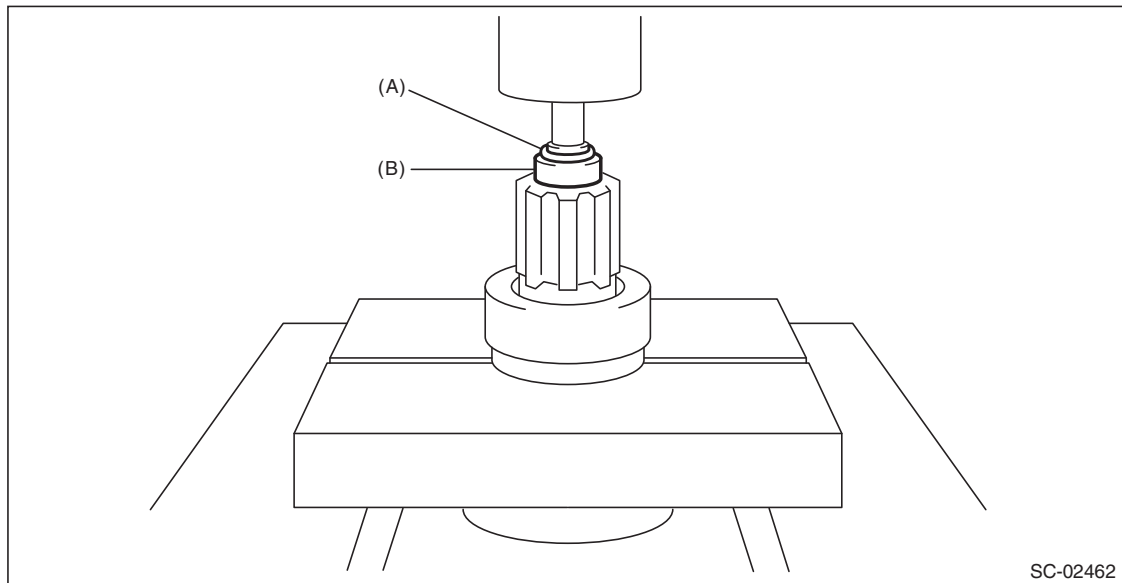
Use new stoppers and snap rings.



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- (4) Using a press, pressure fit stopper (B) into snap ring (A).



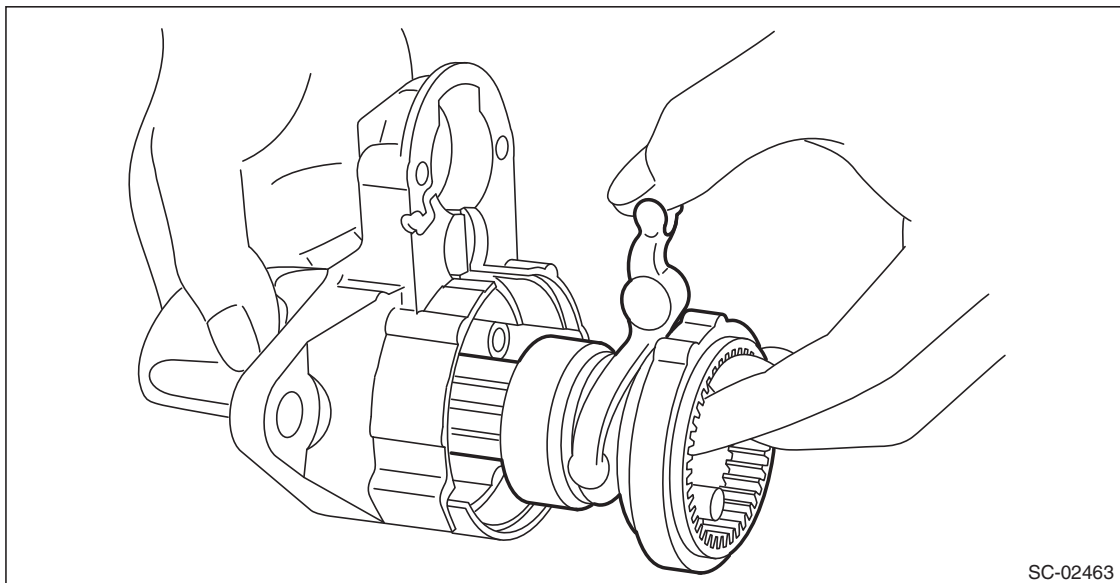
- 4) Assemble the overrunning clutch, internal gear assembly, shaft and shift lever as a single unit into the starter housing assembly.

NOTE:

Apply grease to the moving parts of the shift lever.

Grease:

Multemp #6129 or equivalent



Starter

STARTING/CHARGING SYSTEMS

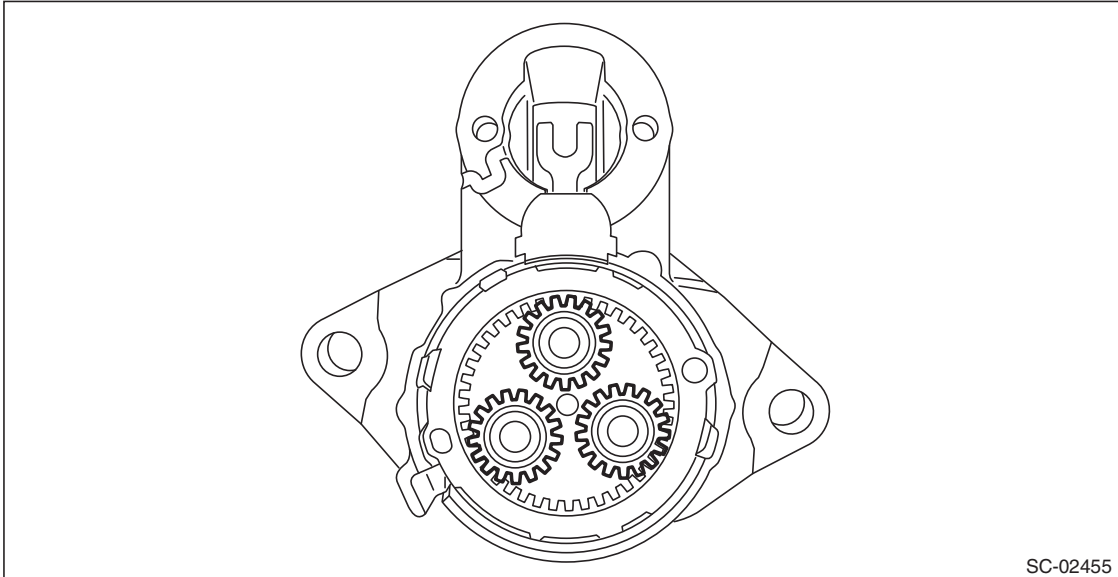
5) Apply grease to the inside of the internal gear assembly and pinion gear, and attach the pinion gear to the internal gear assembly.

NOTE:

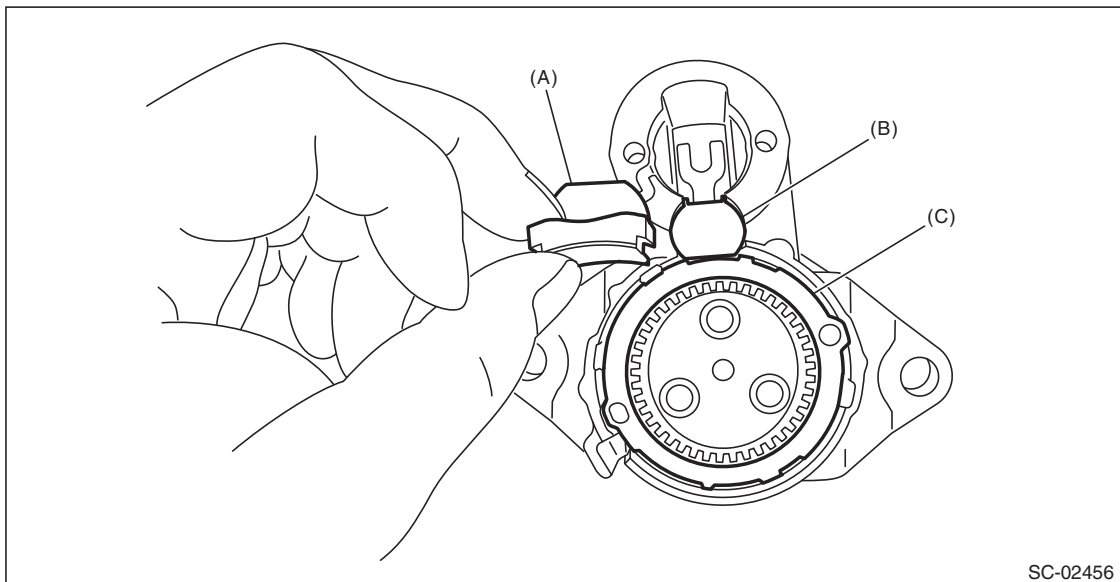
- Apply grease evenly to the contact surfaces of each gear.
- Be careful that no debris becomes attached.

Grease:

Molykote® AG650 or equivalent



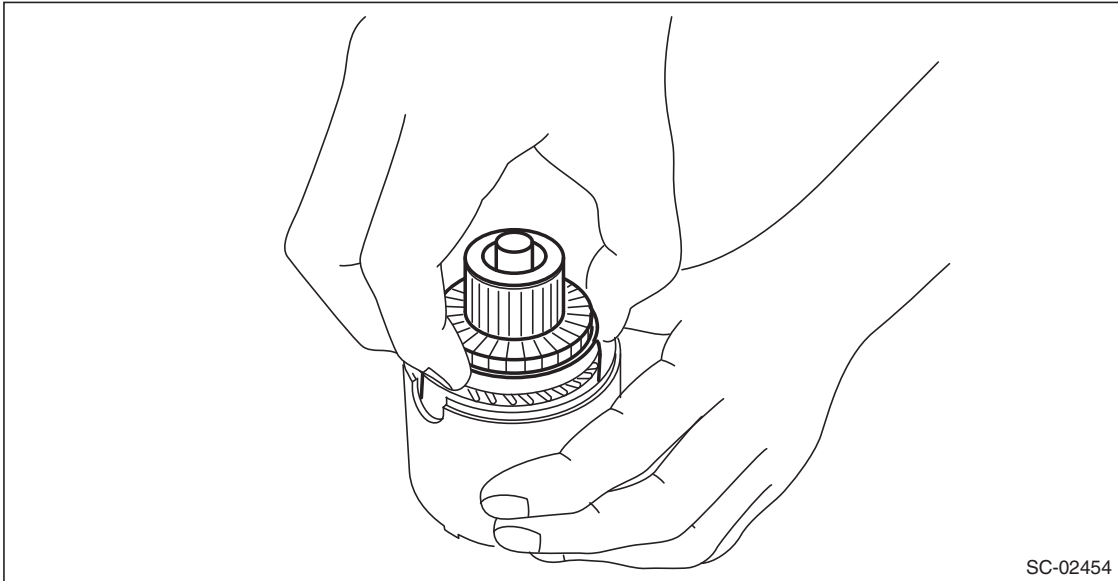
6) Install seal rubber (A), plate (B), and seal rubber (C).



Starter

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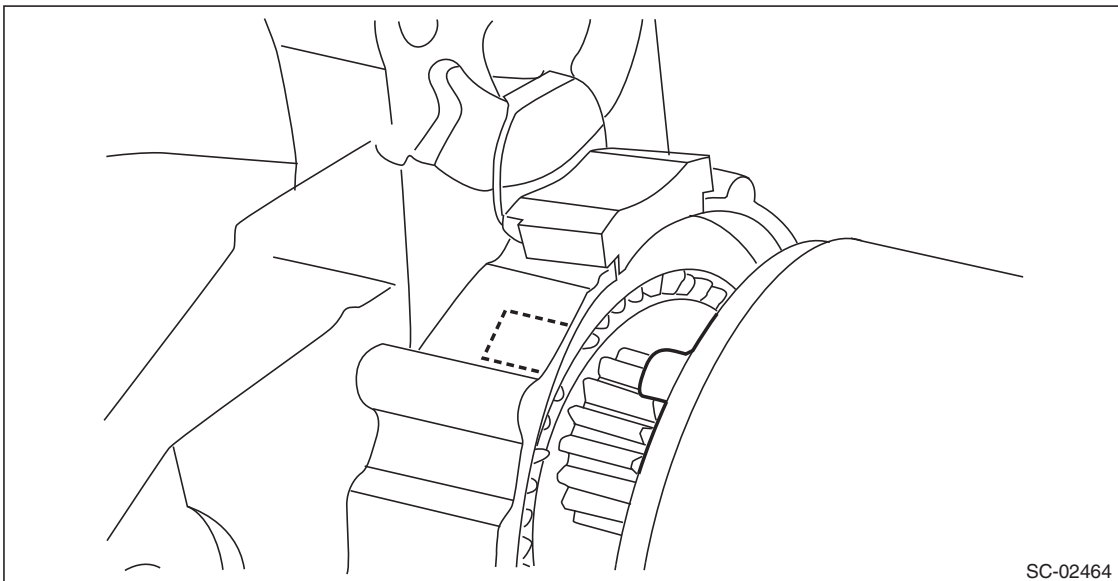
7) Assemble the armature assembly to the yoke assembly.



8) Attach the armature assembly and yoke assembly to the starter housing assembly together as a single unit.

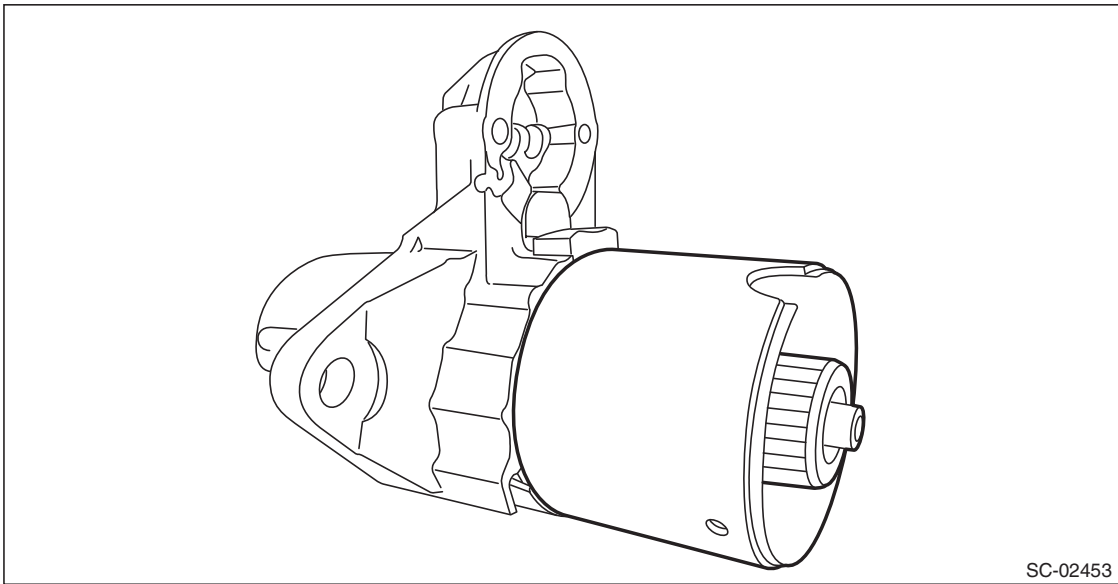
NOTE:

As shown in the figure, match the protrusion of the yoke assembly to the cut out of the starter housing assembly.



Starter

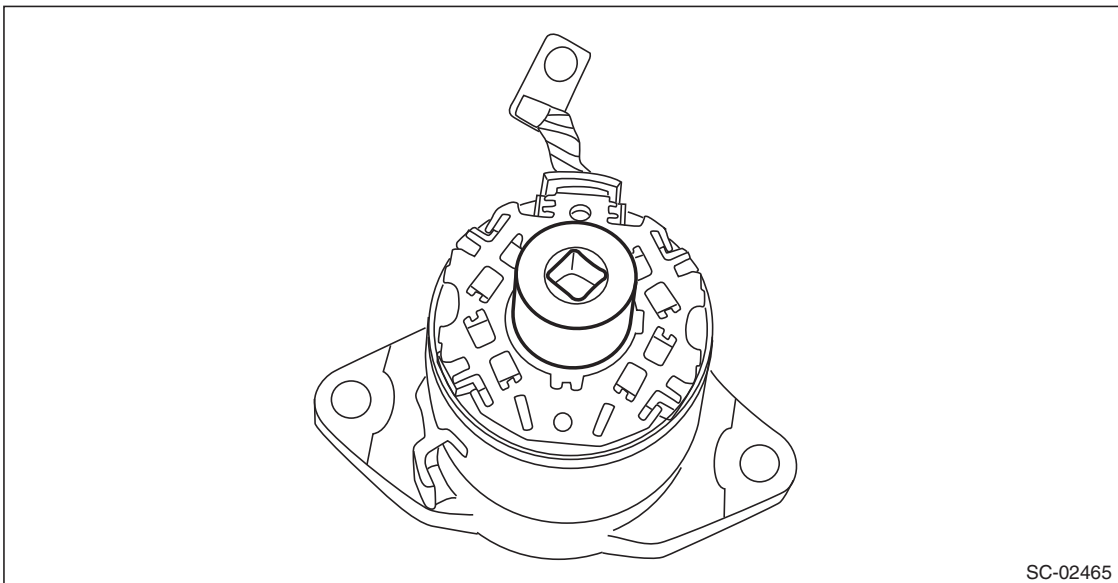
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9) Use an appropriate tool (such as correctly sized socket wrenches) and attach the brush holder assembly to the armature assembly.

NOTE:

Be careful not to damage the brushes.



10) Secure starter cover assembly to the brush holder assembly with screws (A).

Tightening torque:

1.4 N·m (0.1 kgf-m, 1.0 ft-lb)

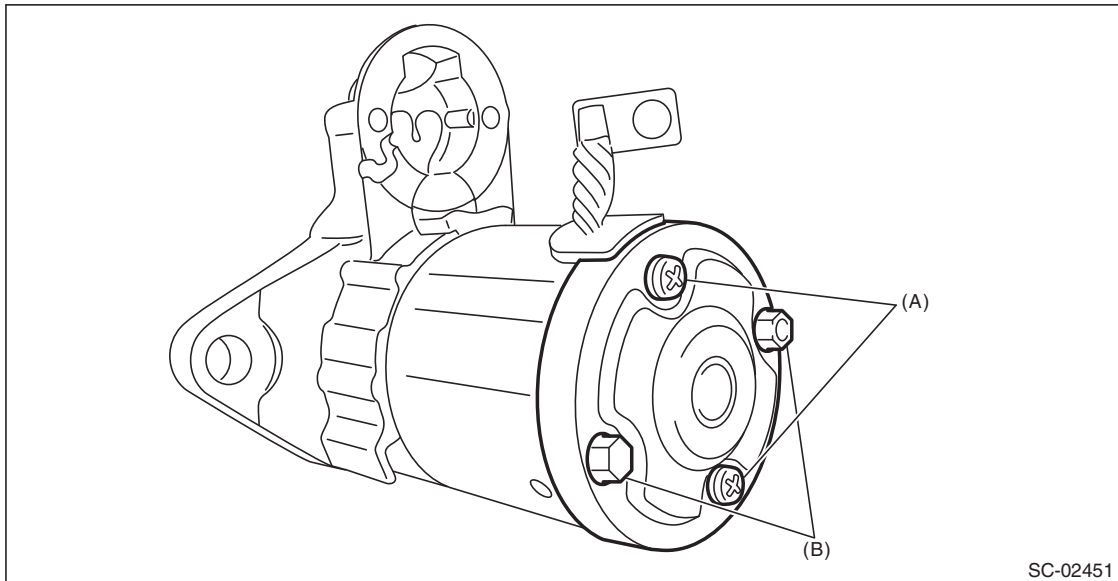
Starter

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11) Tighten through bolts (B) on both sides.

Tightening torque:

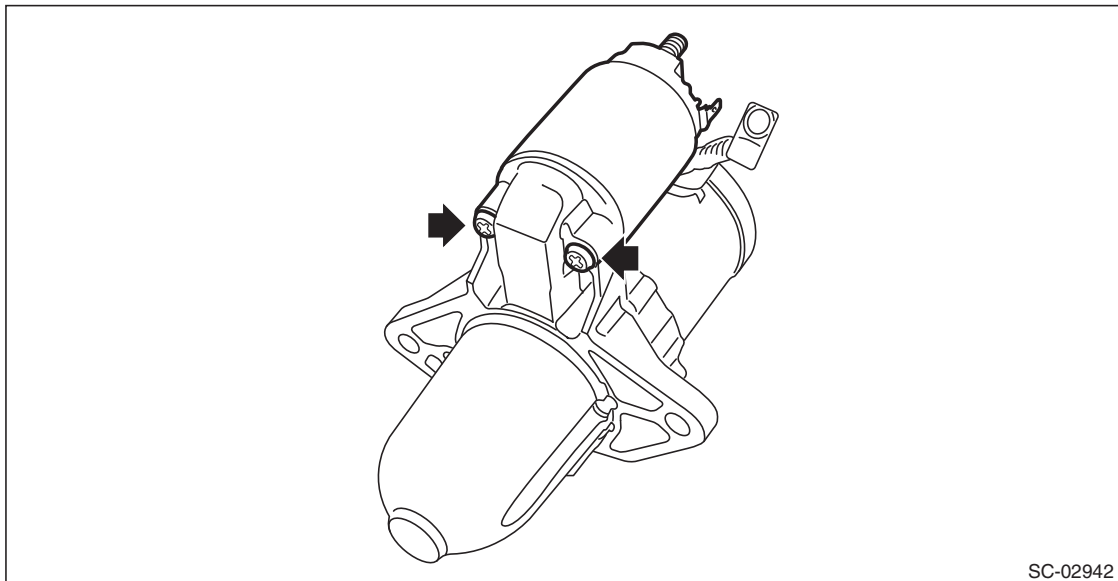
6 N·m (0.6 kgf-m, 4.4 ft-lb)



12) Attach the magnet switch assembly to the starter housing assembly.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



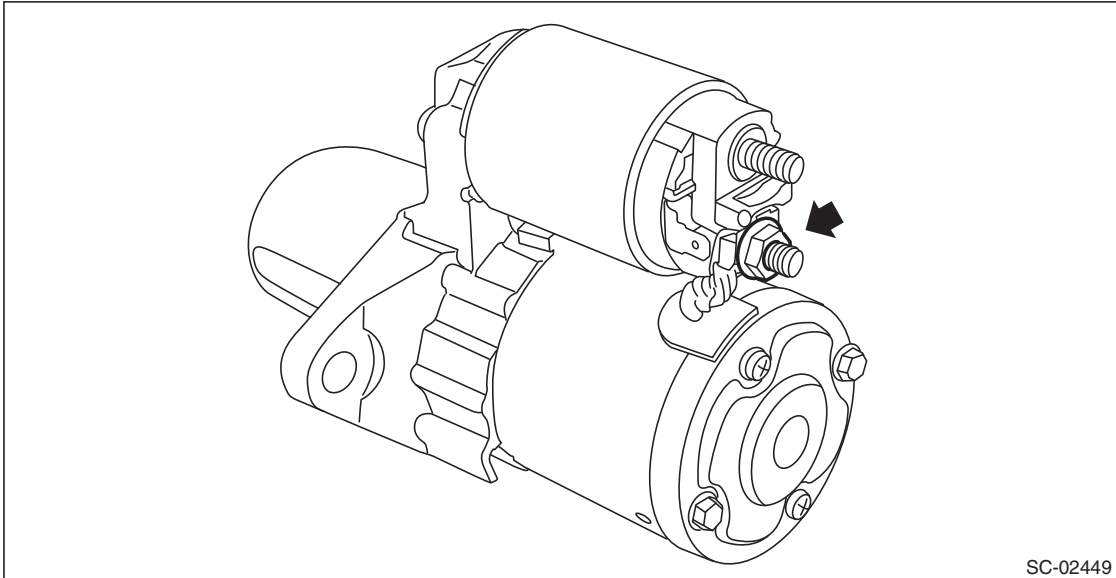
Starter

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13) Attach the cable to the terminal M of the magnet switch assembly, and secure with nuts.

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)



SC-02449

E: INSPECTION

1. ARMATURE

- 1) Check the commutator for signs of seizure or stepped wear caused by roughness of the surface. If there is light wear, use sandpaper to repair.
- 2) Check for runout on the commutator. If excessive, replace the armature.

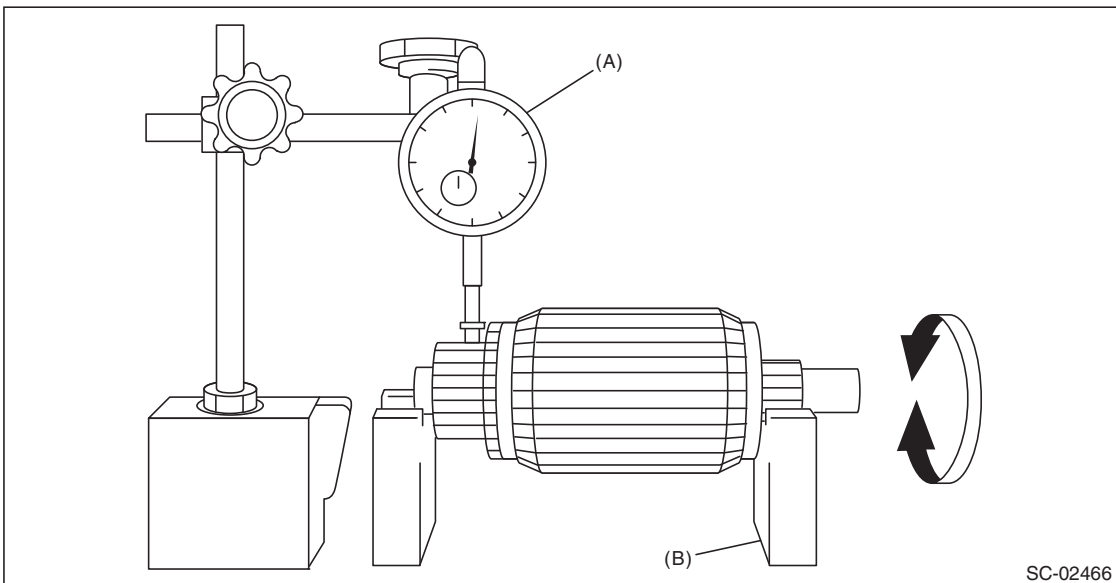
Commutator runout:

Standard

0.05 mm (0.0020 in)

Limit

0.10 mm (0.0039 in)



SC-02466

(A) Dial gauge

(B) V-block

Starter

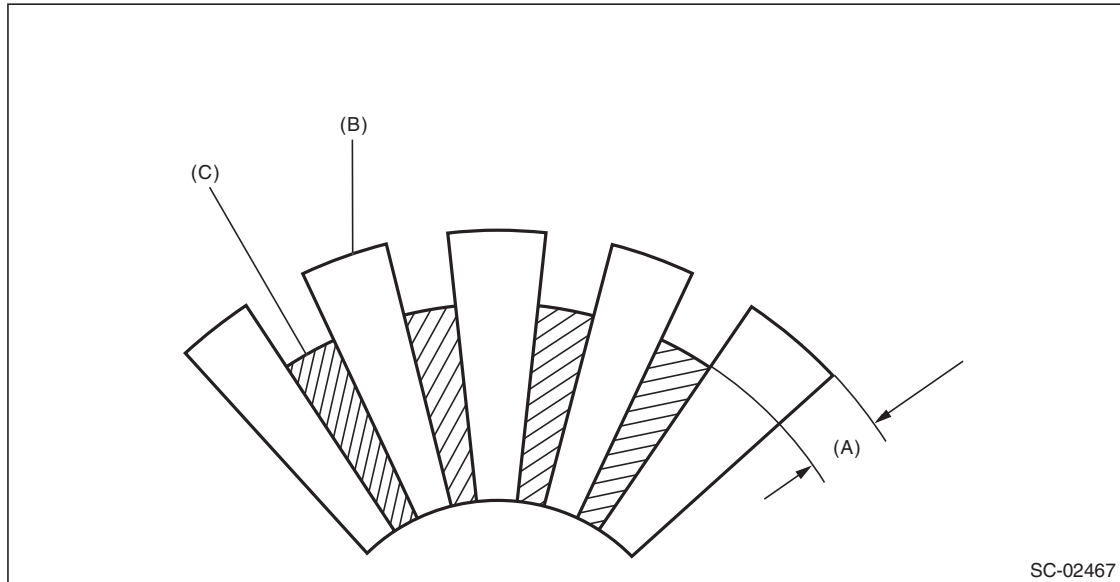
STARTING/CHARGING SYSTEMS

3) Check the depth of the segment mold. If it is not within the standard, replace the armature.

Depth of segment mold:

Standard

0.50 mm (0.020 in)

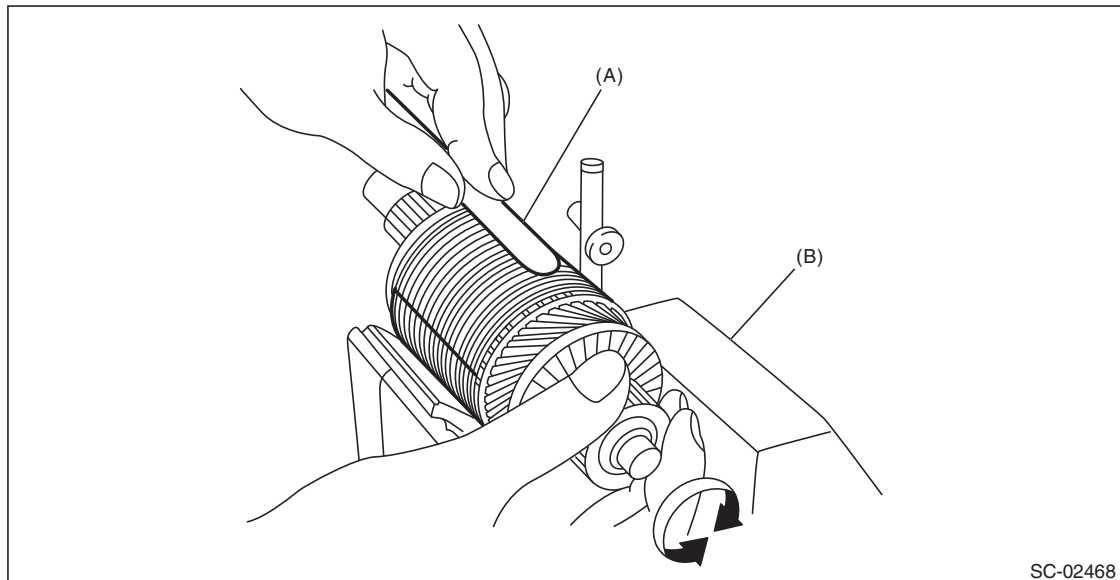


(A) Depth of mold

(B) Segment

(C) Mold

4) Place the armature on the growler tester to check for short circuits. While slowly turning the armature, support the steel sheet for the armature core. If the circuit of the armature is shorted, the steel sheet will vibrate, causing it to move towards the core. When the steel sheet has moved or vibrated, replace the armature.



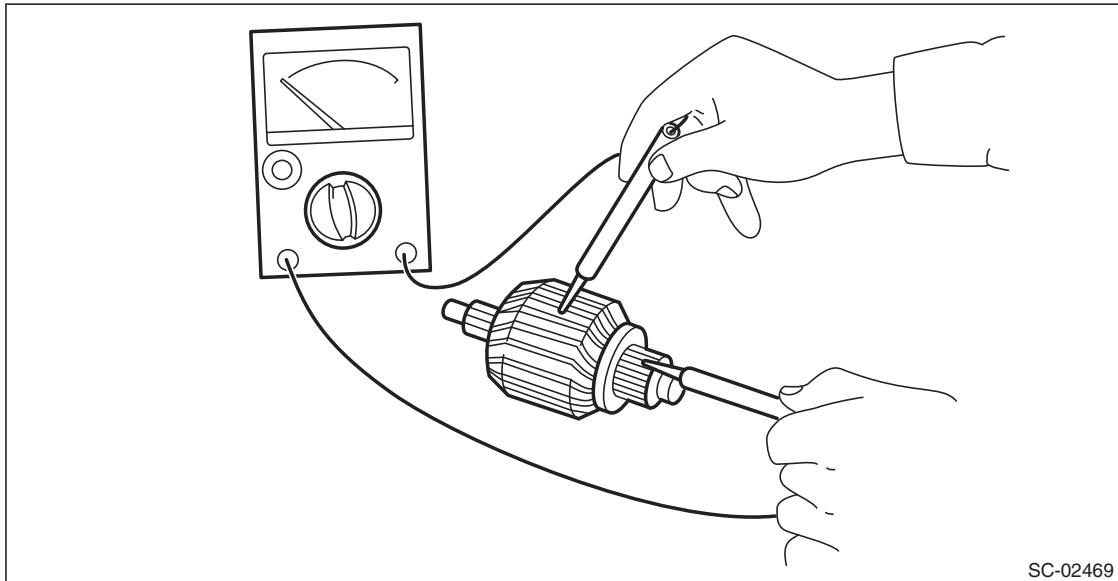
(A) Steel sheet

(B) Growler tester

Starter

STARTING/CHARGING SYSTEMS

5) Use a circuit tester to touch the probe of one side to the commutator segment, and the other probe to the shaft. If there is continuity, replace the armature.



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2. YOKE

Make sure that the pole is set at the predetermined position.

3. OVERRUNNING CLUTCH

Inspect the pinion, and if there is any wear or damage, replace the overrunning clutch. Also, check that the pinion rotates counterclockwise smoothly and does not rotate clockwise. If there is any fault, replace the overrunning clutch.

CAUTION:

To prevent spilling of grease, do not clean the overrunning clutch with oil.

Starter

STARTING/CHARGING SYSTEMS

4. BRUSH AND BRUSH HOLDER

- 1) Visually check the brush. If there is any abnormal wear or cracks, replace the brush.
- 2) Measure the length of the brush. If it exceeds service limits, replace the brush.

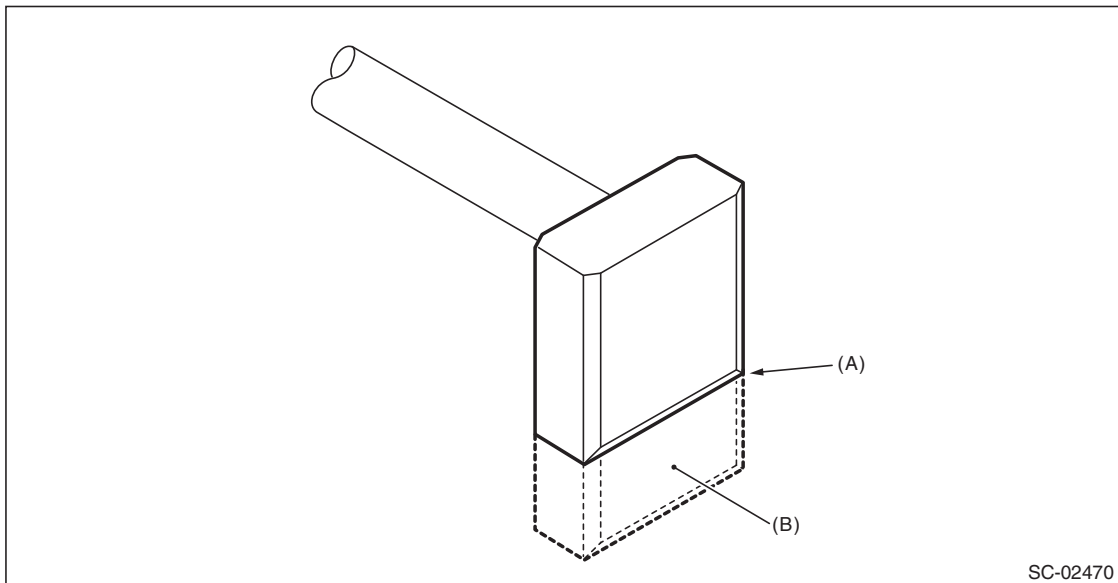
Brush length:

Standard

12.3 mm (0.484 in)

Limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

- 3) Check that the brush moves smoothly in the brush holder.
- 4) Measure the brush spring force with a spring scale. Replace the brush holder if below the service limit.

Brush spring force:

Standard

15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf) (When new)

Limit

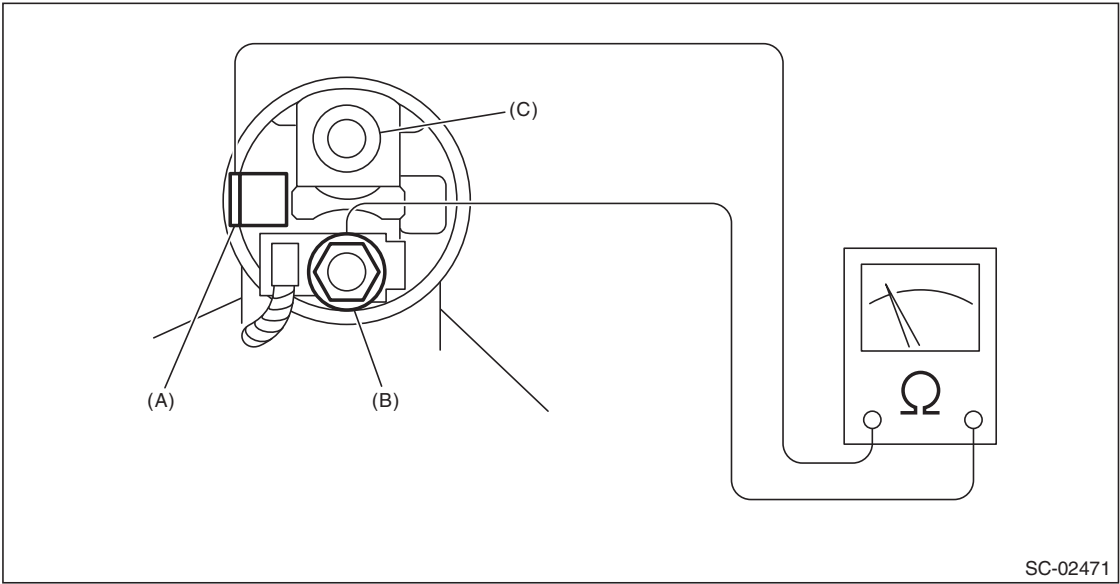
2.5 N (0.25 kgf, 0.56 lbf)

5. SWITCH ASSEMBLY

Using a circuit tester (set to “ohm”), check that there is continuity between terminals S and M, and between terminal S and ground. Also check to be sure there is no continuity between terminal M and B.

Resistance between switch assembly terminals:

Terminals	Standard
S — M	1 Ω or less
S — Ground	1 Ω or less
M — B	1 MΩ or more



(A) Terminal S

(B) Terminal M

(C) Terminal B

Starter

STARTING/CHARGING SYSTEMS

6. SWITCH ASSEMBLY OPERATION

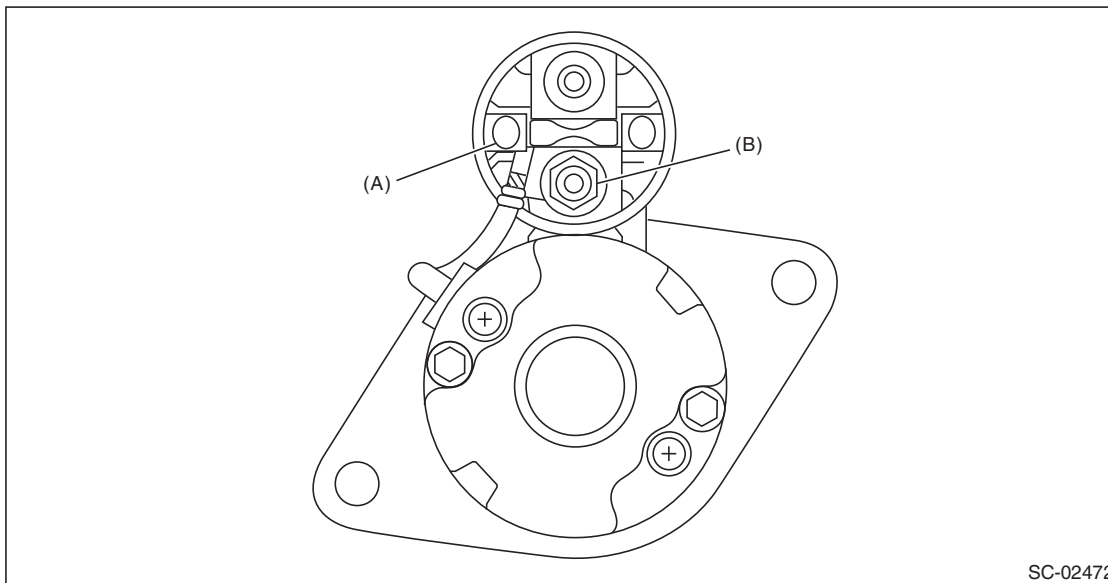
1) Using a lead wire, connect the switch assembly terminal S to the positive terminal of battery, and the starter body to the ground terminal of battery. The pinion should be forced endwise on shaft.

NOTE:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M. Then using a lead wire, connect the positive terminal of battery and terminal M, and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



(A) Terminal S

(B) Terminal M

Starter

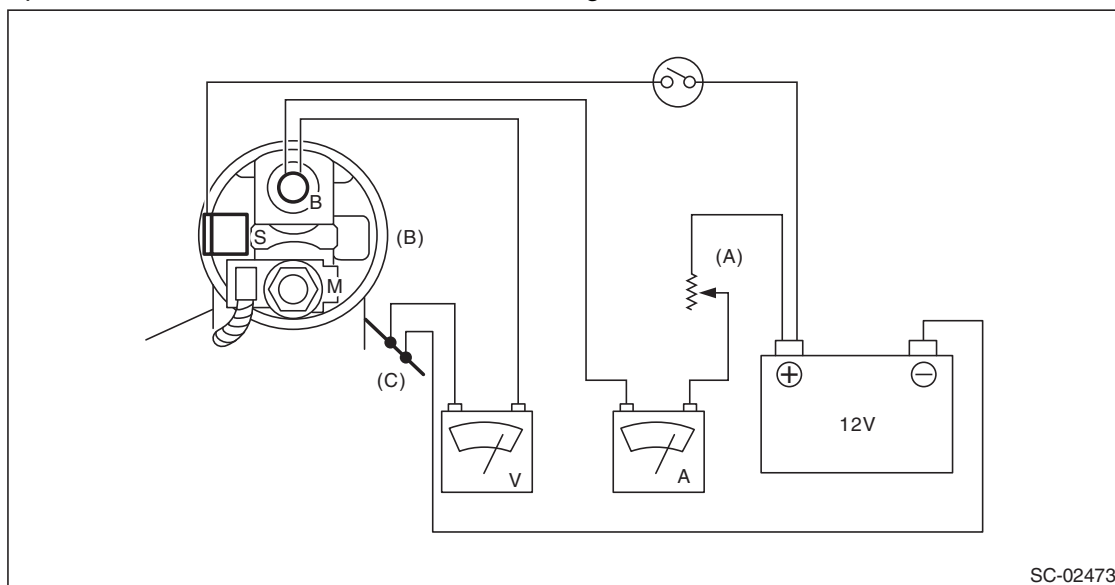
STARTING/CHARGING SYSTEMS

7. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



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(A) Variable resistance

(B) Magnet switch

(C) Starter body

1) Adjust the variable resistance with the switch on until the voltage is 11 V, and read the value displayed by the ammeter to measure starter speed. Compare these values with the standard.

No-load test (standard):

Voltage/Current

Non-turbo CVT model

Max. 11 V/90 A or less

Non-turbo MT model

Max. 11 V/95 A or less

Turbo model

Max. 11 V/90 A or less

Rotating speed

Non-turbo CVT model

2,370 rpm or more

Non-turbo MT model

2,500 rpm or more

Turbo model

2,000 rpm or more

Starter

STARTING/CHARGING SYSTEMS

2) Apply the specified braking torque to starter. The condition is normal if the current draw and starter speed are within standard.

Load test (standard):

Voltage/Load

Non-turbo CVT model

7.5 V/10.65 N·m (1.1 kgf-m, 7.8 ft-lb)

Non-turbo MT model

7.5 V/8.84 N·m (0.9 kgf-m, 6.5 ft-lb)

Turbo model

7.7 V/16.7 N·m (1.7 kgf-m, 12.3 ft-lb)

Current/Speed

Non-turbo CVT model

300 A/840 rpm or more

Non-turbo MT model

300 A/870 rpm or more

Turbo model

400 A/710 rpm or more

3) With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to standard voltage.

Lock test (standard):

Voltage/Current

Non-turbo CVT model

4 V/780 A or less

Non-turbo MT model

4 V/680 A or less

Turbo model

3.5 V/960 A or less

Torque

Non-turbo CVT model

20 N·m (2.0 kgf-m, 14.8 ft-lb) or more

Non-turbo MT model

17 N·m (1.7 kgf-m, 12.5 ft-lb) or more

Turbo model

31 N·m (3.2 kgf-m, 22.9 ft-lb) or more

8. OTHER INSPECTIONS

Check that the starter does not have deformation, cracks and any other damage.

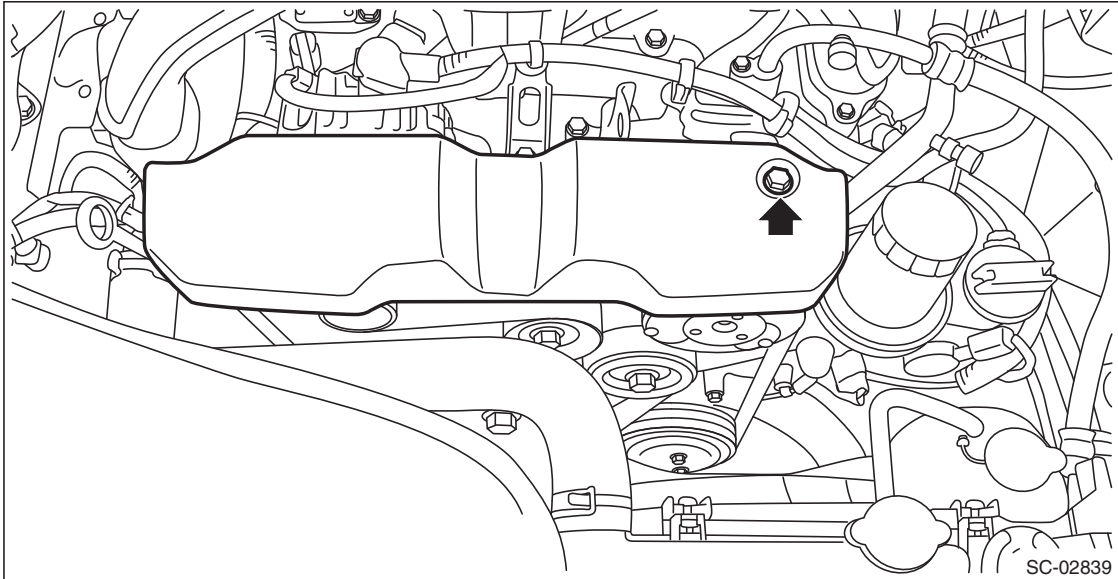


3. Generator

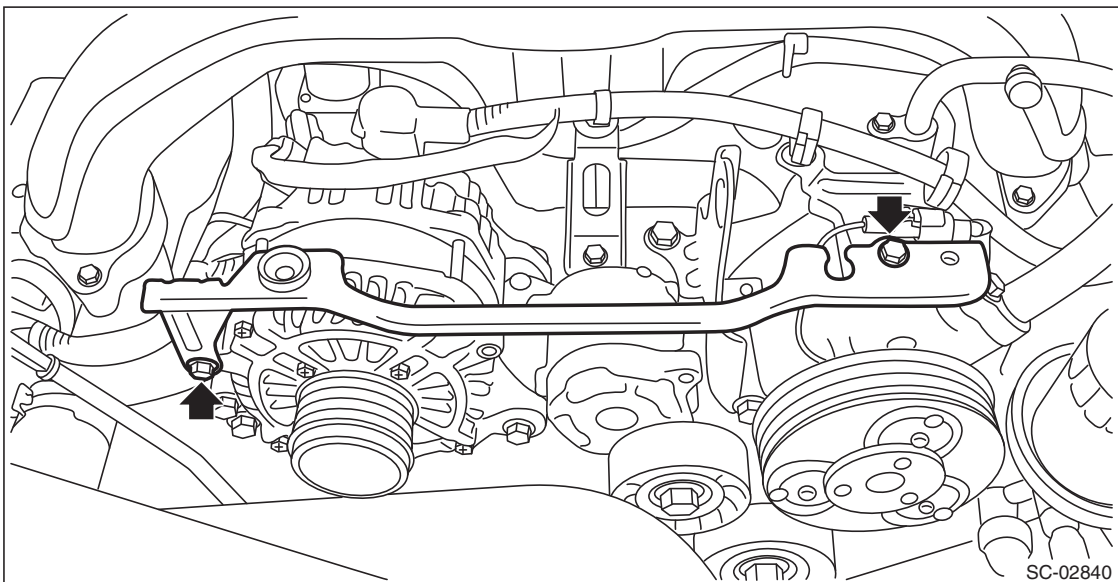
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove the V-belt covers.



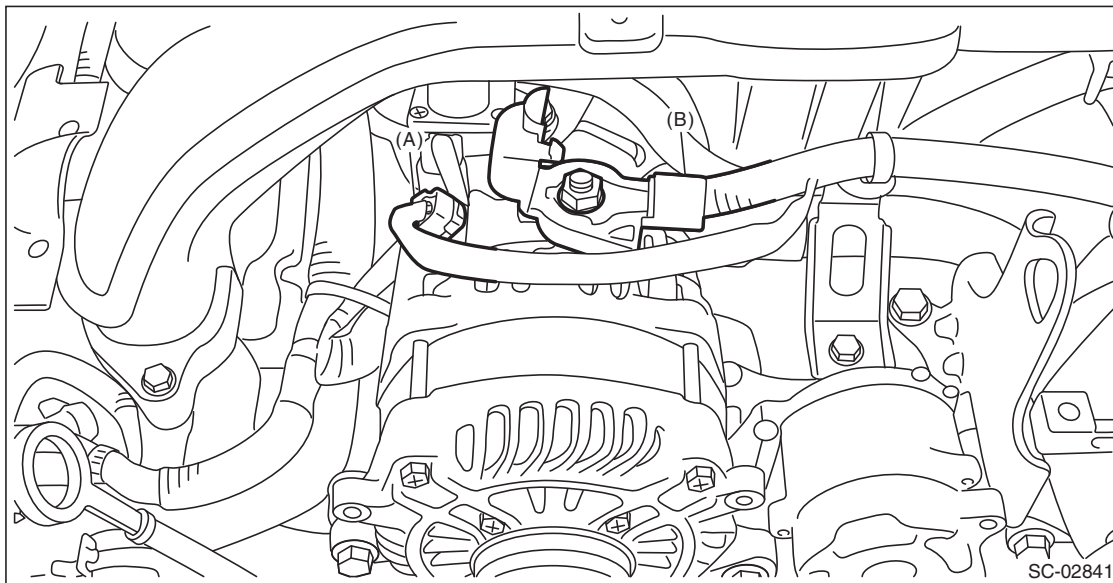
- 2) Disconnect the ground cable from battery.
- 3) Remove the V-belts. <Ref. to ME(H4DO)-83, V-BELT, REMOVAL, V-belt.>
- 4) Remove the V-belt cover bracket.



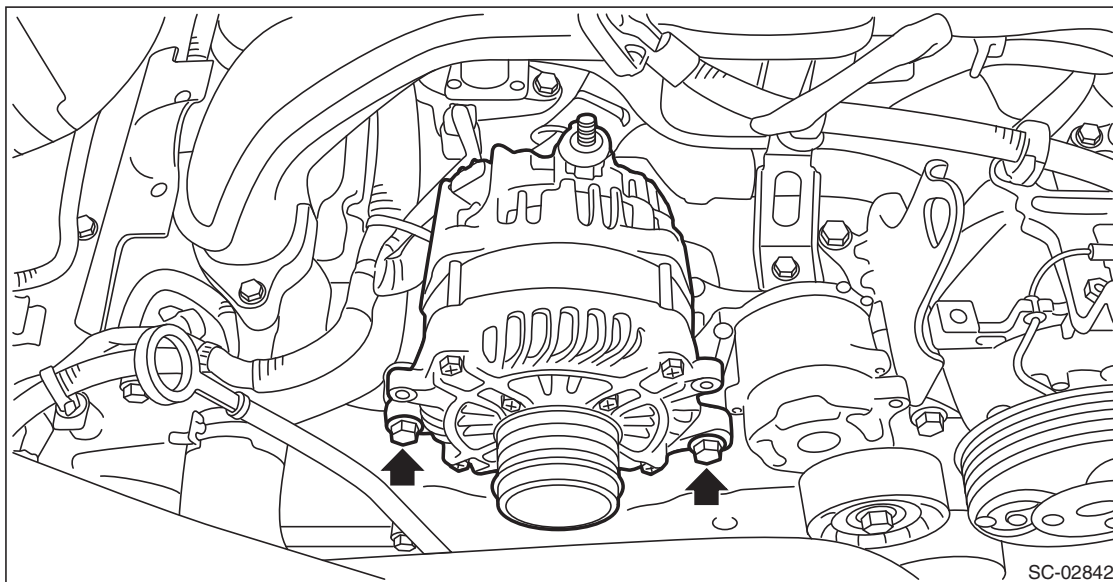
Generator

STARTING/CHARGING SYSTEMS

- 5) Disconnect the connector (A) and terminal (B) from the generator.



- 6) Remove the generator from the generator bracket.

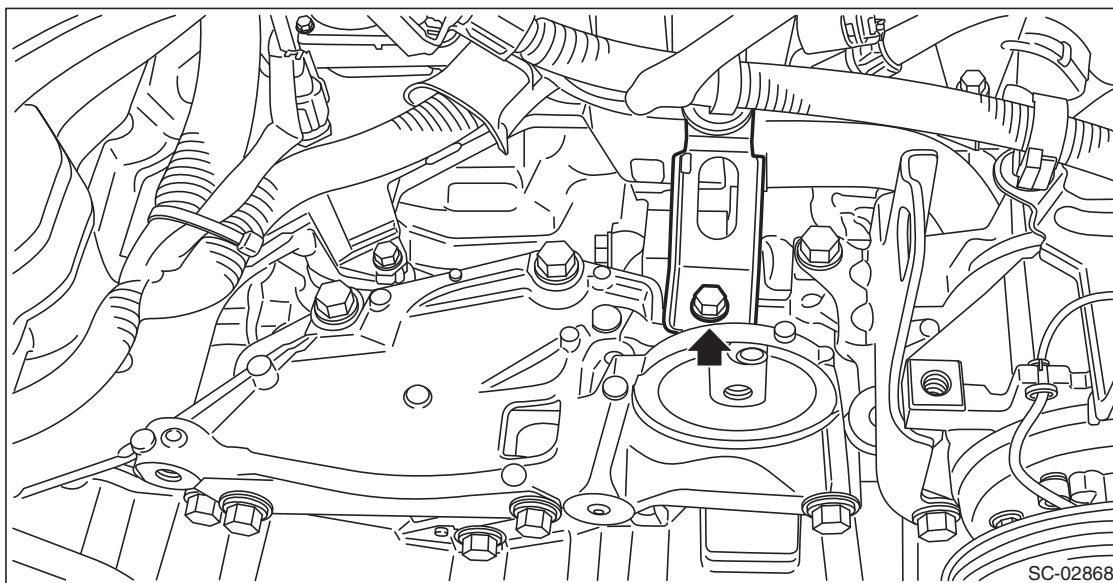


- 7) Remove the V-belt tensioner from the generator bracket. <Ref. to ME(H4DO)-84, V-BELT TENSIONER ASSY, REMOVAL, V-belt.>

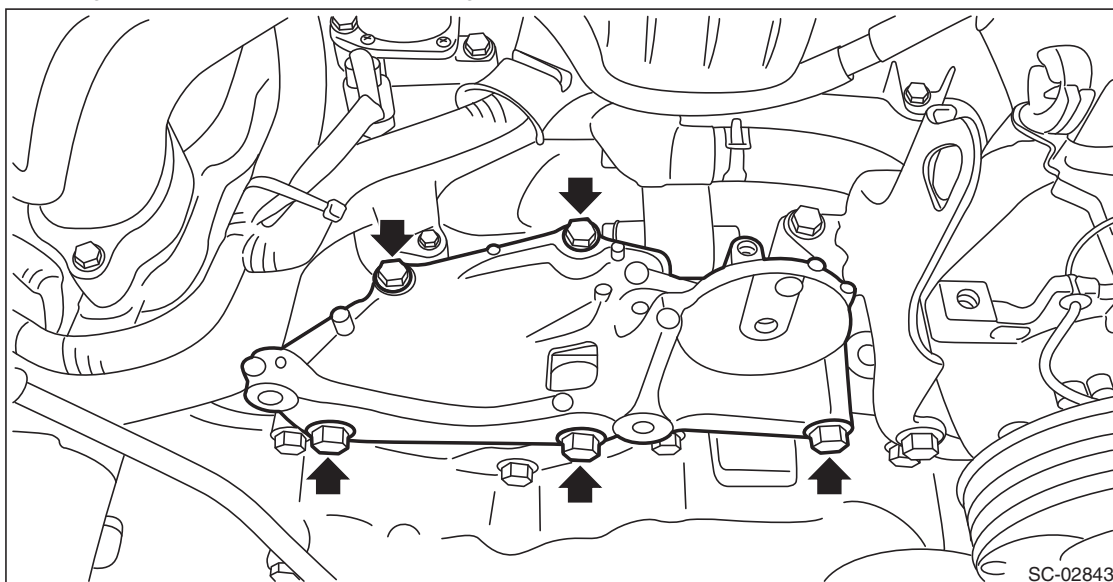
Generator

STARTING/CHARGING SYSTEMS

- 8) Remove the generator cord stay from the generator bracket.



- 9) Remove the generator bracket from the engine.

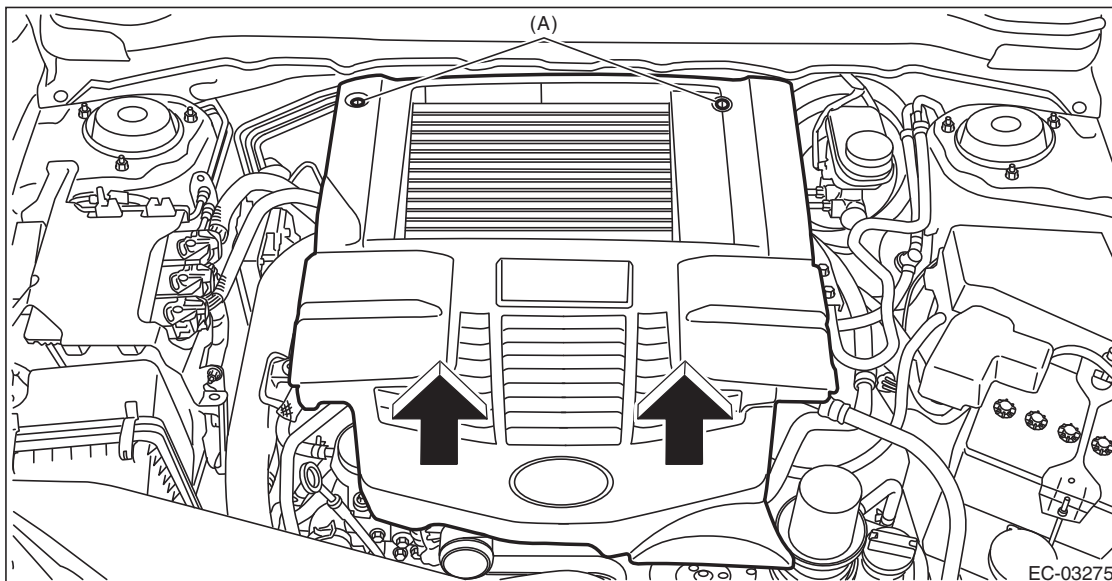


Generator

STARTING/CHARGING SYSTEMS

2. TURBO MODEL

1) Remove the clip (A), lift the front of the collector cover in the direction of arrow, and then remove the collector cover.

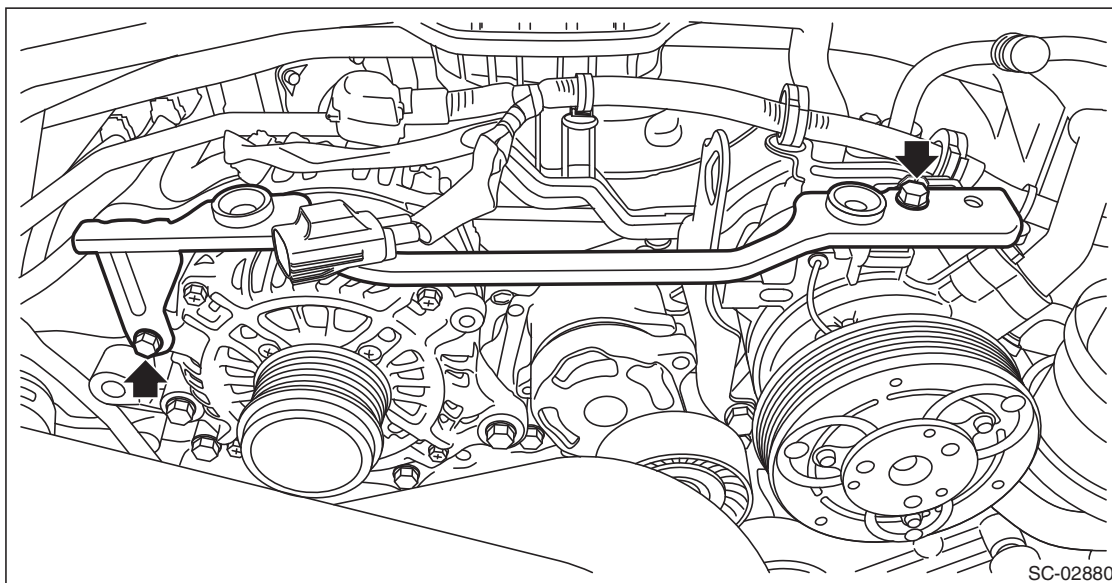


2) Disconnect the ground cable from battery.

3) Remove the brake booster vacuum pump. <Ref. to BR-79, REMOVAL, Brake Vacuum Pump.>

4) Remove the V-belts. <Ref. to ME(H4DOTC)-75, V-BELT, REMOVAL, V-belt.>

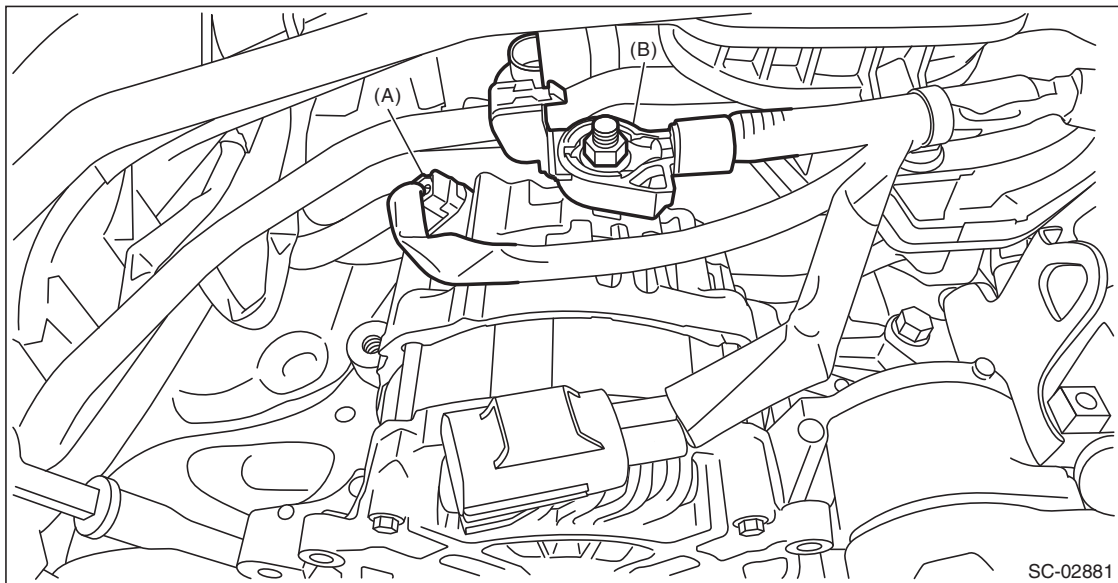
5) Remove the collector cover bracket.



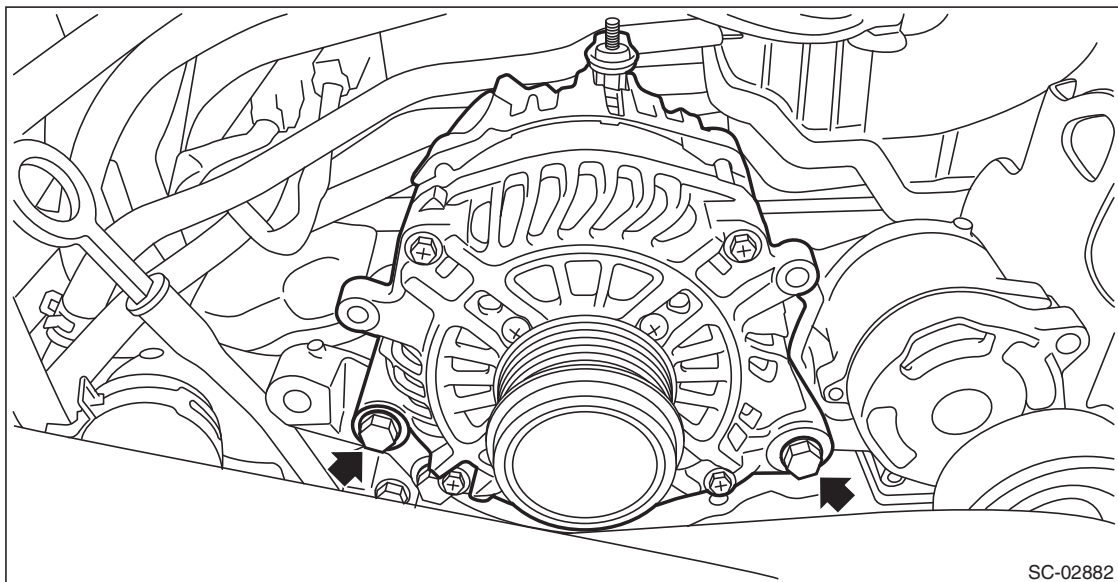
Generator

STARTING/CHARGING SYSTEMS

- 6) Disconnect the connector (A) and terminal (B) from the generator.



- 7) Remove the generator from the generator bracket.

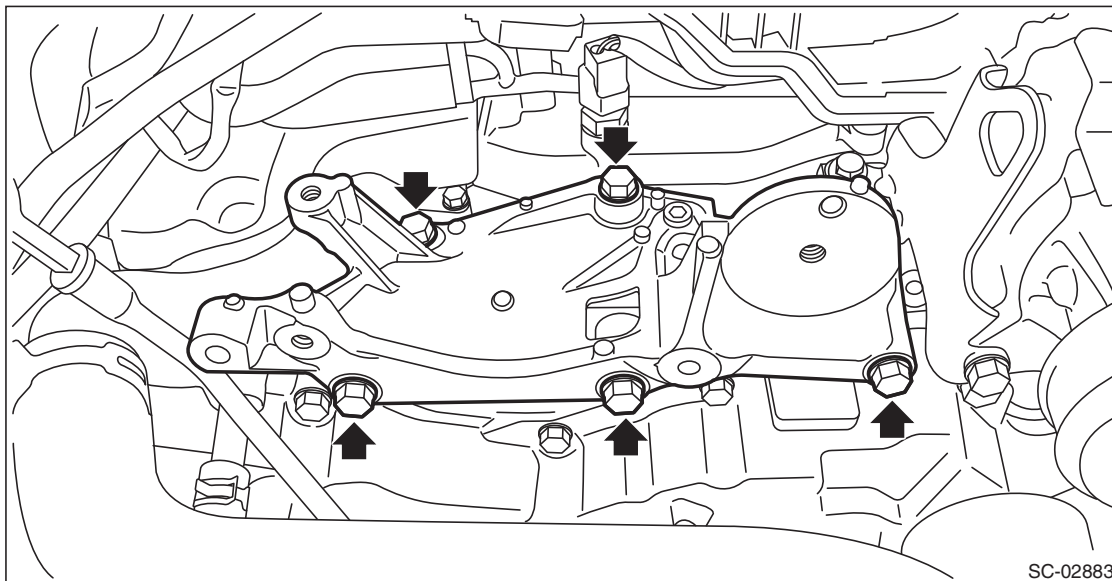


- 8) Remove the V-belt tensioner from the generator bracket. <Ref. to ME(H4DOTC)-76, V-BELT TENSIONER ASSEMBLY, REMOVAL, V-belt.>

Generator

STARTING/CHARGING SYSTEMS

- 9) Remove the generator bracket from the engine.



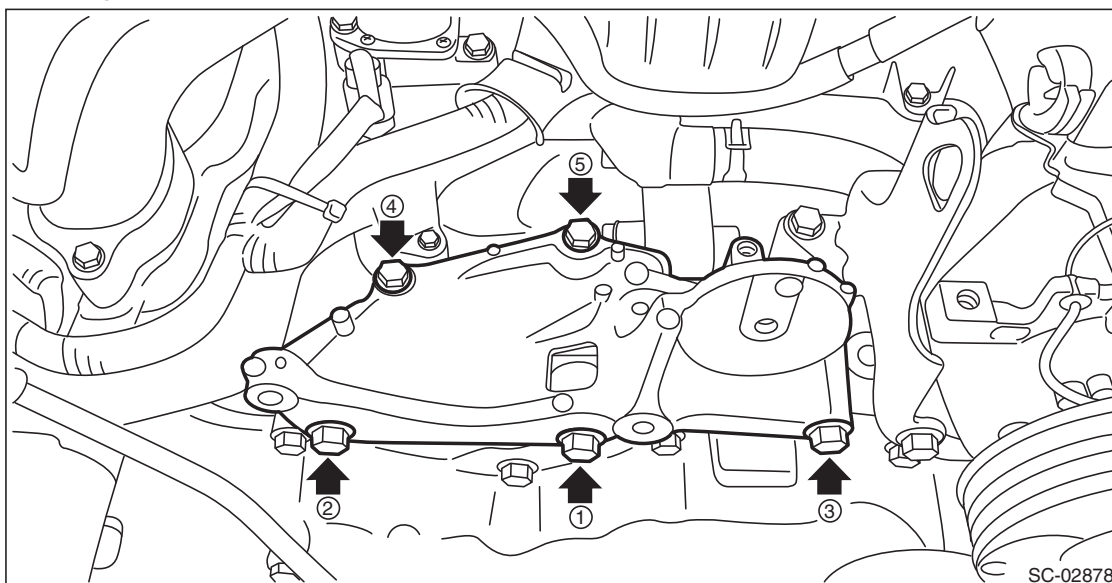
B: INSTALLATION

1. NON-TURBO MODEL

- 1) Temporarily install the generator bracket to the engine and tighten the bolts in the numerical order.

Tightening torque:

36 N·m (3.7 kgf-m, 26.6 ft-lb)



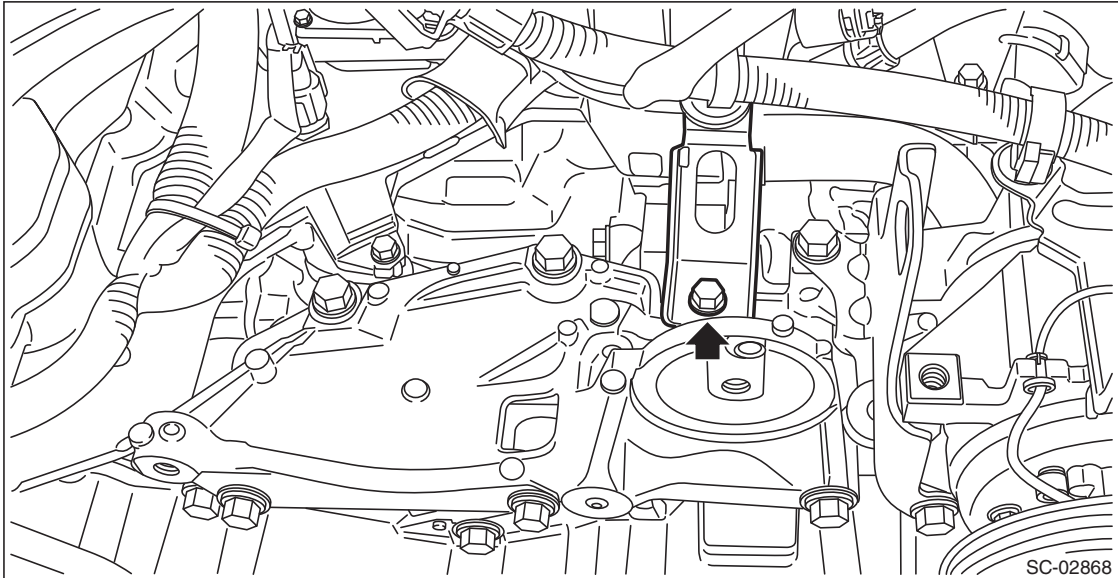
Generator

STARTING/CHARGING SYSTEMS

2) Install the generator cord stay to the generator bracket.

Tightening torque:

6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

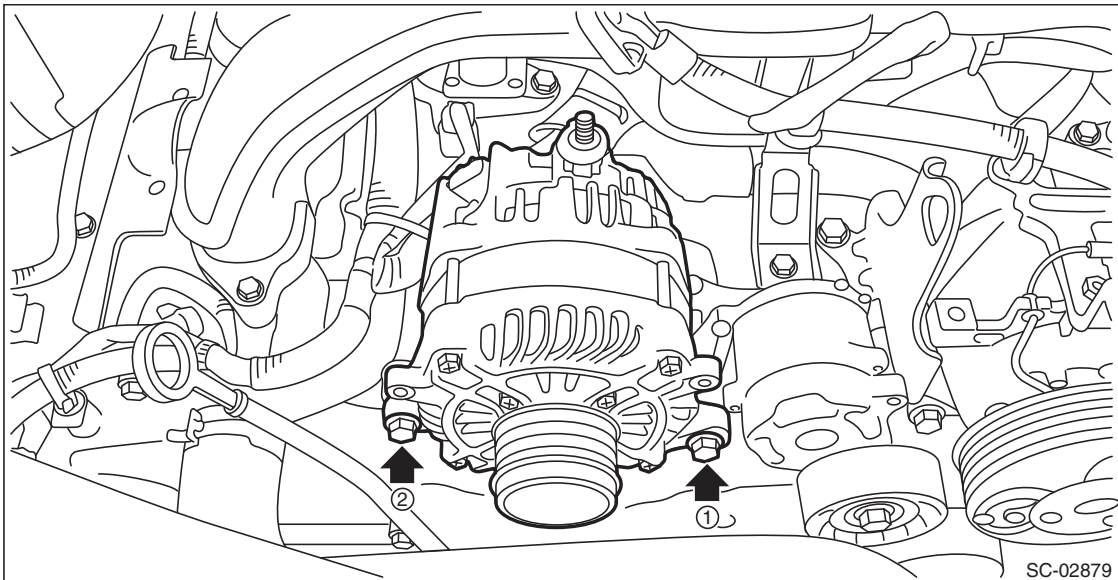


3) Install the V-belt tensioner to the generator bracket. <Ref. to ME(H4DOTC)-79, V-BELT TENSIONER ASSY, INSTALLATION, V-belt.>

4) Temporarily install the generator bracket to the generator and tighten the bolts in the numerical order.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



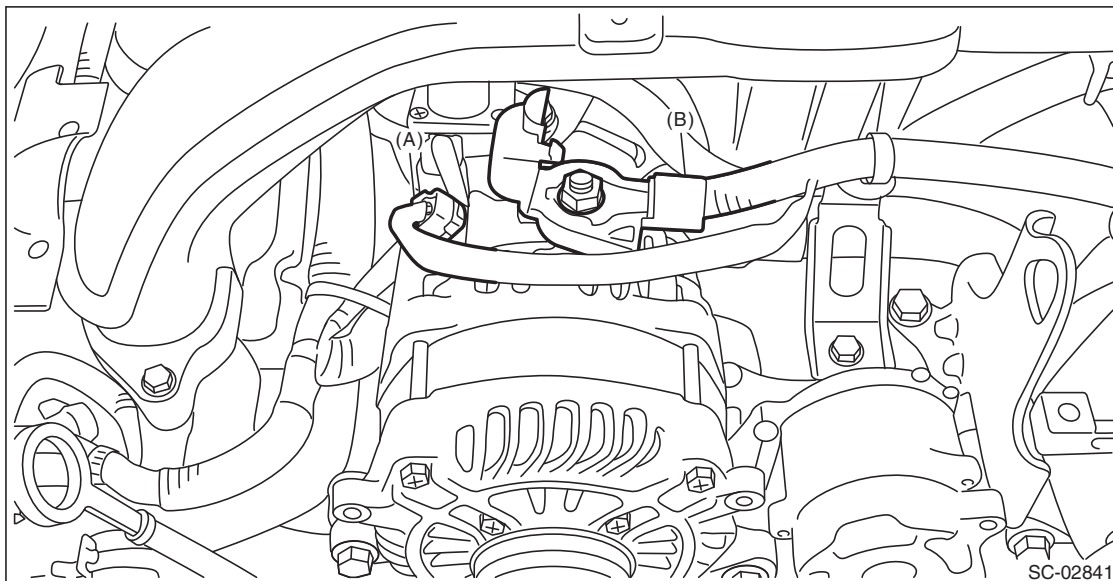
Generator

STARTING/CHARGING SYSTEMS

5) Connect the connector (A) and terminal (B) to the generator.

Tightening torque:

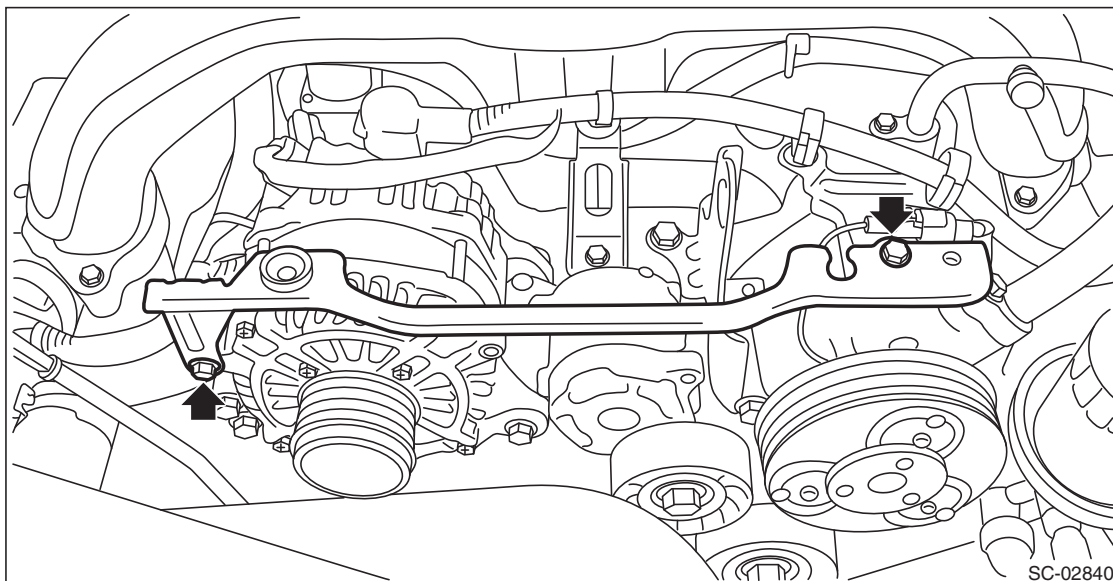
16 N·m (1.6 kgf-m, 11.8 ft-lb)



6) Install the V-belt cover bracket.

Tightening torque:

6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



7) Install the V-belts. <Ref. to ME(H4DO)-86, V-BELT, INSTALLATION, V-belt.>

8) Connect the battery ground terminal.

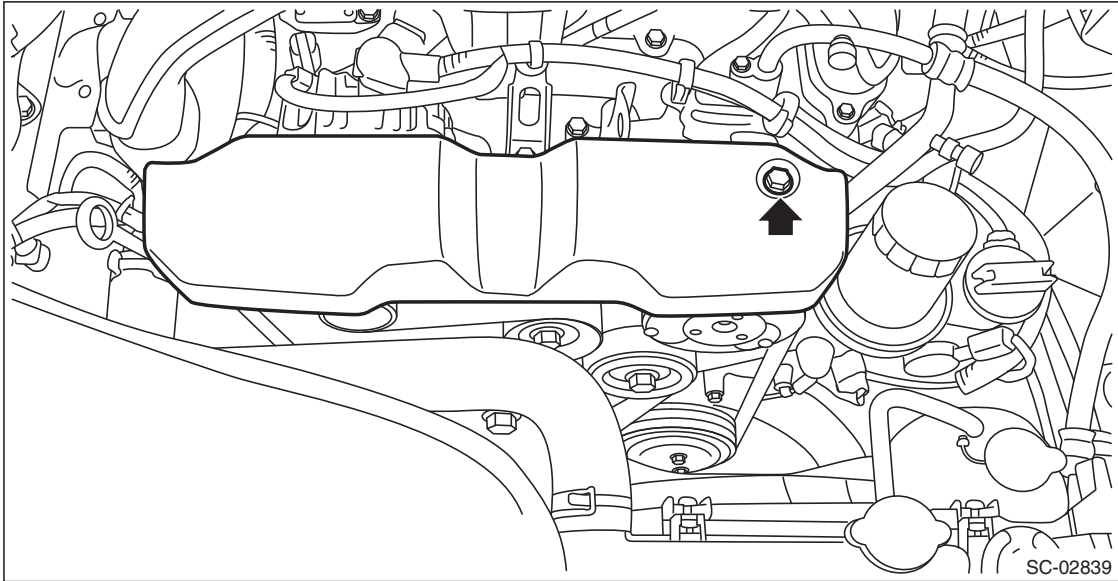
Generator

STARTING/CHARGING SYSTEMS

9) Install the V-belt cover.

Tightening torque:

6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

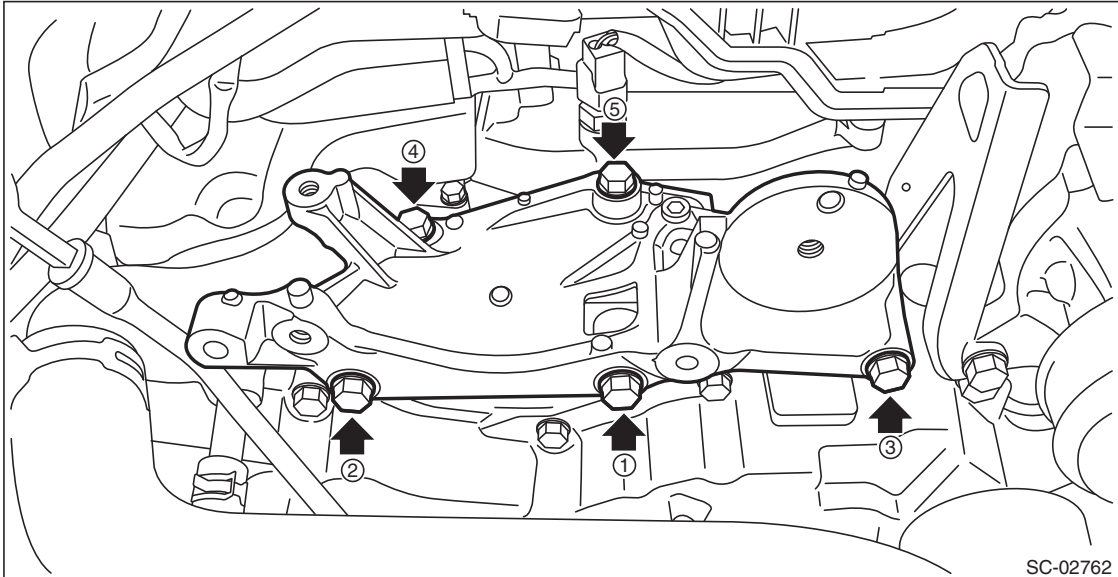


2. TURBO MODEL

1) Temporarily install the generator bracket to the engine and tighten the bolts in the numerical order.

Tightening torque:

36 N·m (3.7 kgf-m, 26.6 ft-lb)



2) Install the V-belt tensioner to the generator bracket. <Ref. to ME(H4DOTC)-79, V-BELT TENSIONER ASSY, INSTALLATION, V-belt.>

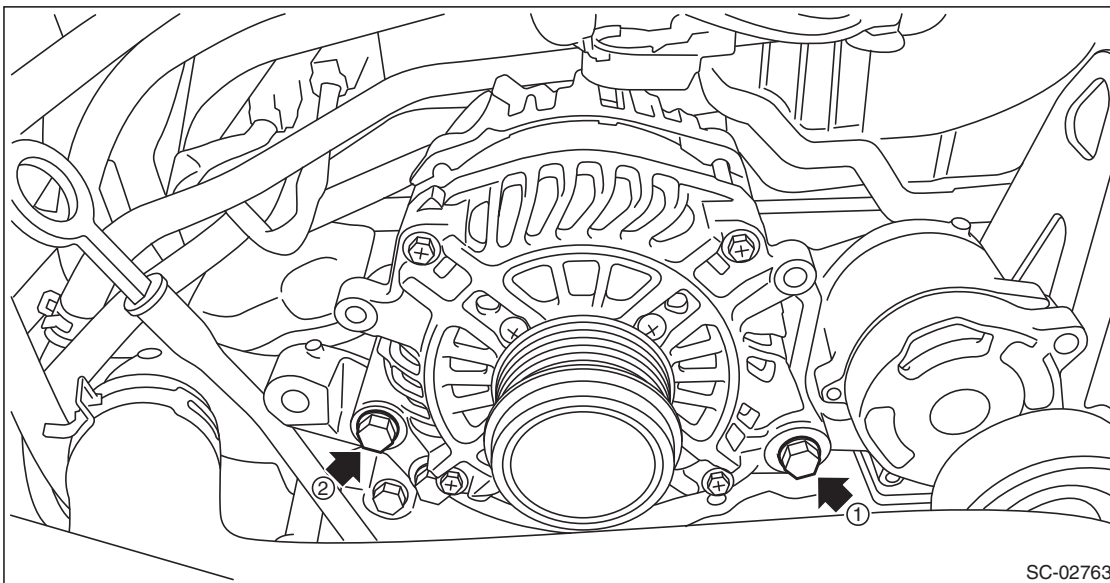
Generator

STARTING/CHARGING SYSTEMS

3) Temporarily install the generator bracket to the generator and tighten the bolts in the numerical order.

Tightening torque:

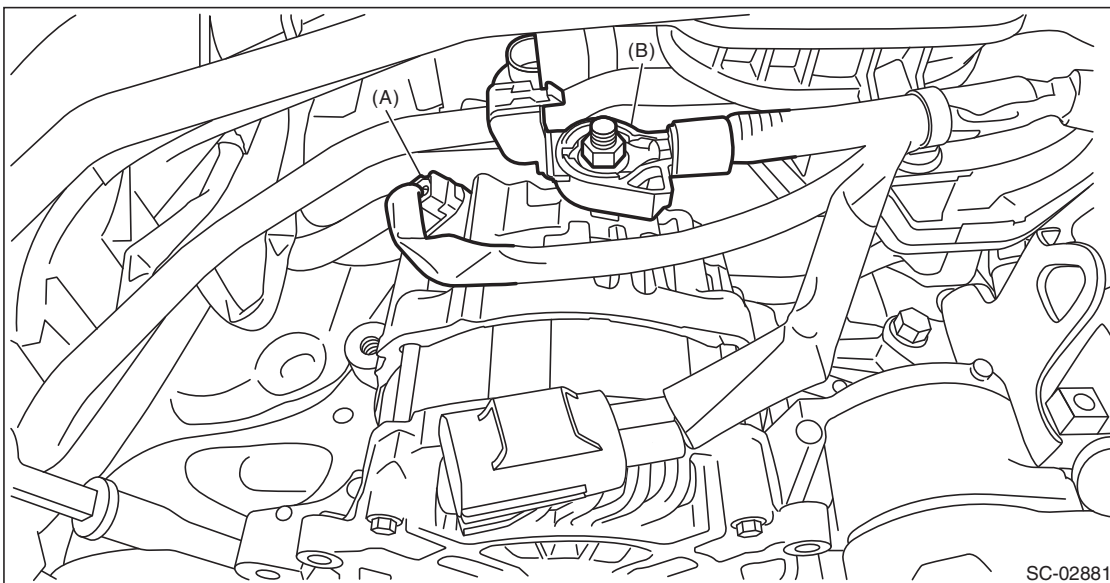
25 N·m (2.5 kgf-m, 18.4 ft-lb)



4) Connect the connector (A) and terminal (B) to the generator.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)



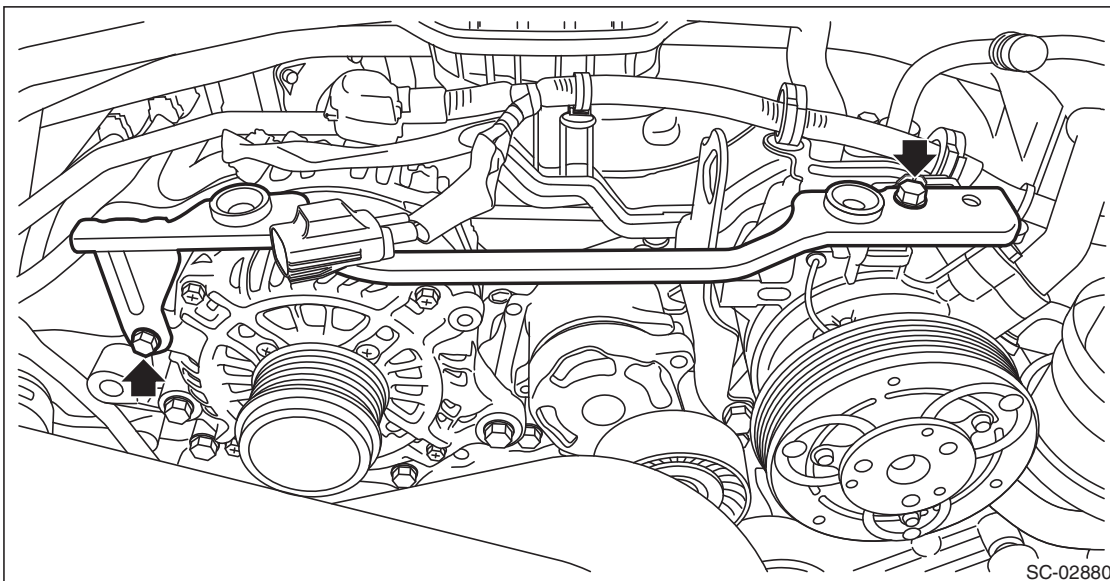
Generator

STARTING/CHARGING SYSTEMS

5) Install the collector cover bracket.

Tightening torque:

6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



6) Install the V-belts. <Ref. to ME(H4DOTC)-78, V-BELT, INSTALLATION, V-belt.>

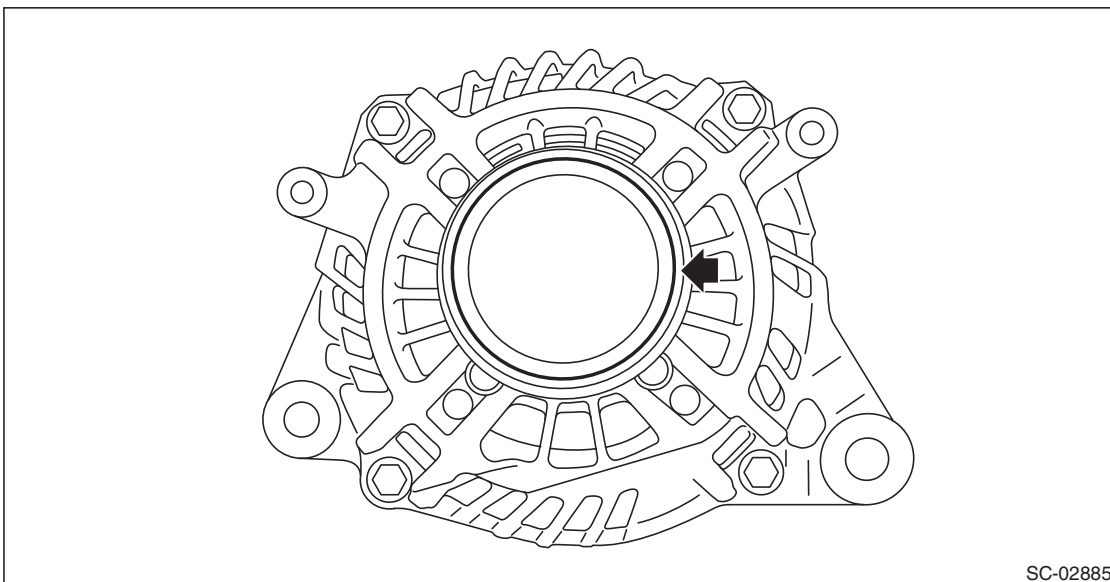
7) Install the brake booster vacuum pump. <Ref. to BR-80, INSTALLATION, Brake Vacuum Pump.>

8) Connect the battery ground terminal.

9) Install the collector cover.

C: DISASSEMBLY

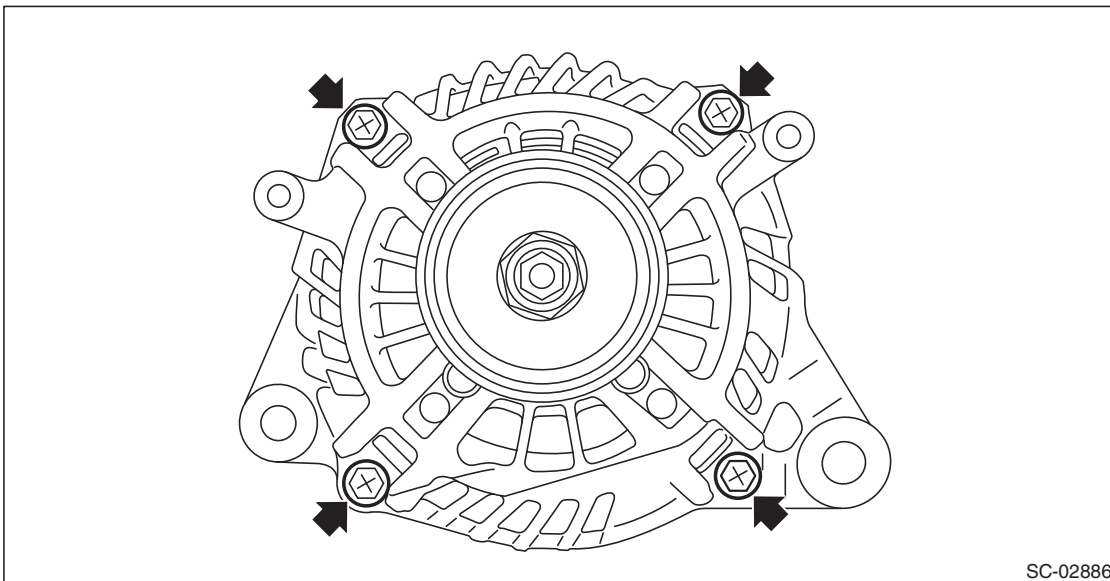
1) Remove the cap from the generator.



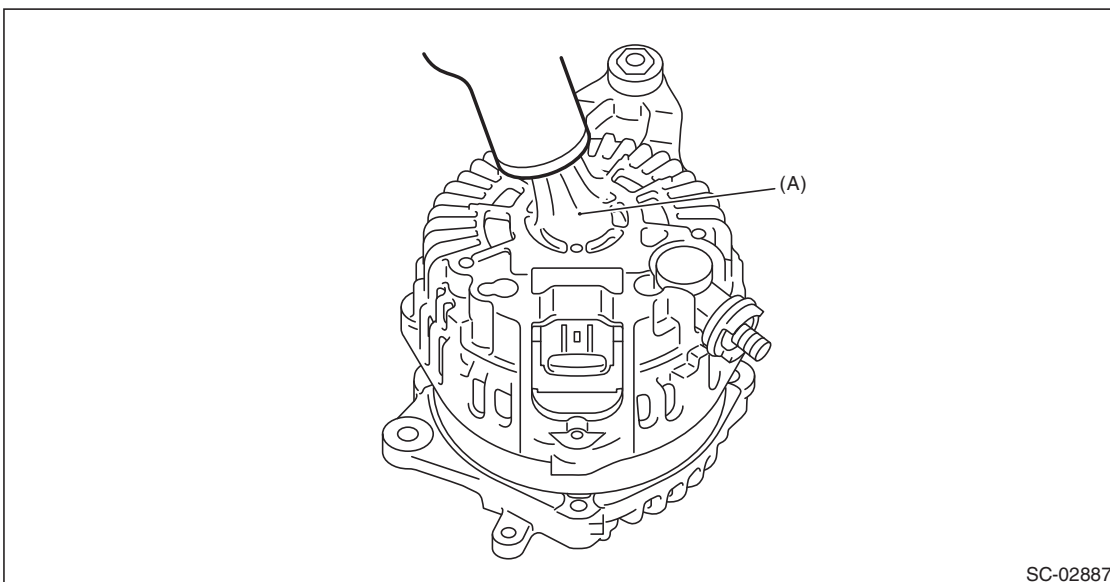
Generator

STARTING/CHARGING SYSTEMS

2) Remove the four through bolts.



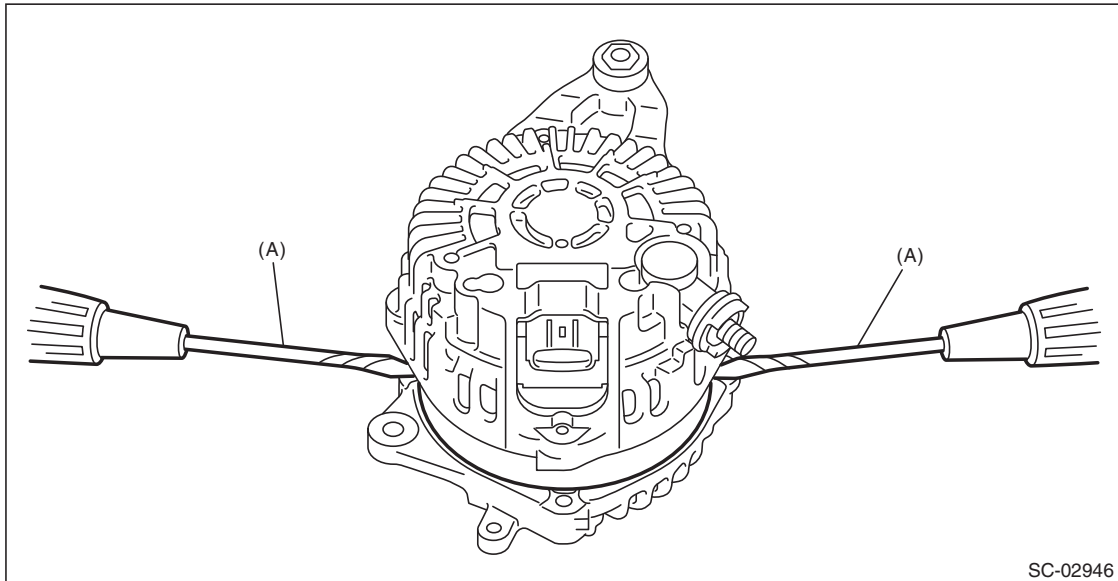
3) Use a drier to heat the rear cover (A) portion to 50 — 60°C (122 — 140°F).



Generator

STARTING/CHARGING SYSTEMS

- 4) Insert a flat tip screwdriver or similar tool wrapped with protective tape into the gap between stator core and the front cover to disassemble.

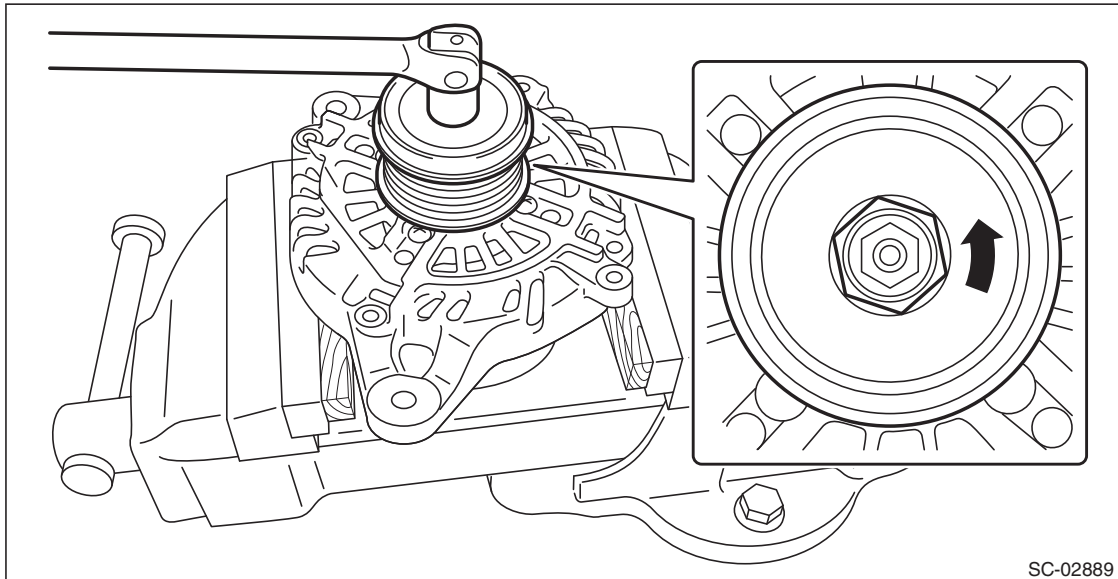


(A) Flat tip screwdriver

- 5) Hold the rotor on a vise and remove the pulley.

CAUTION:

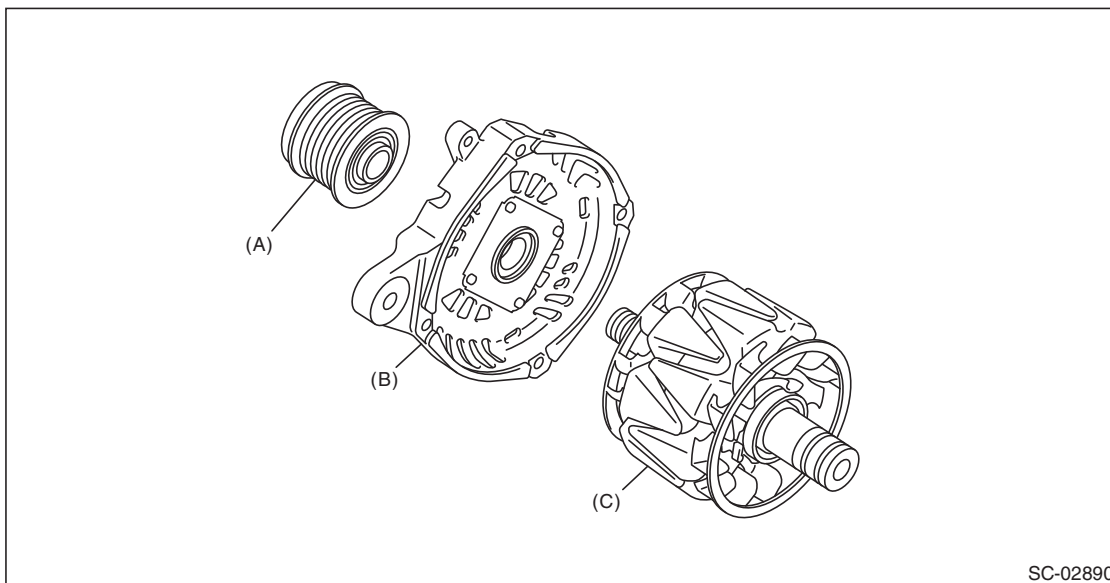
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.



Generator

STARTING/CHARGING SYSTEMS

6) Remove the rotor from the front cover.

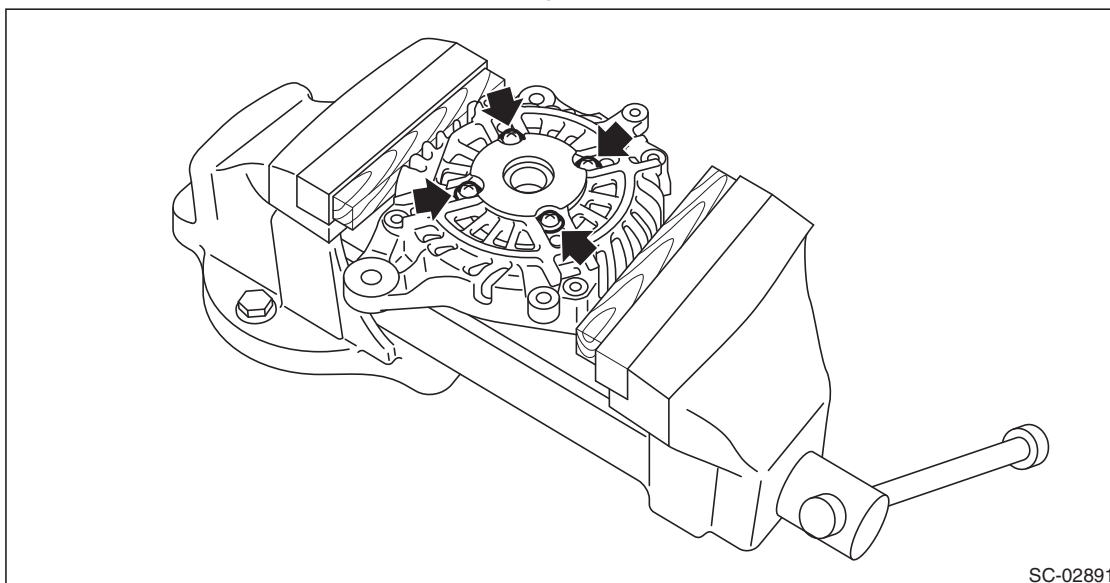


(A) Pulley

(B) Front cover

(C) Rotor

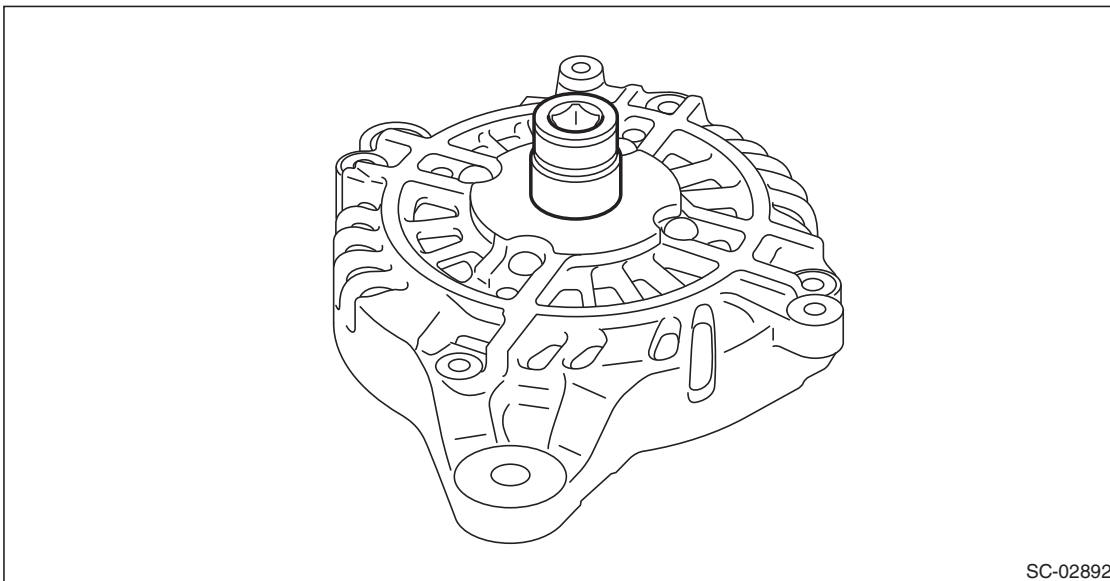
7) Use the following procedures to remove the ball bearings.
(1) Remove the bolt, and then detach the bearing retainer.



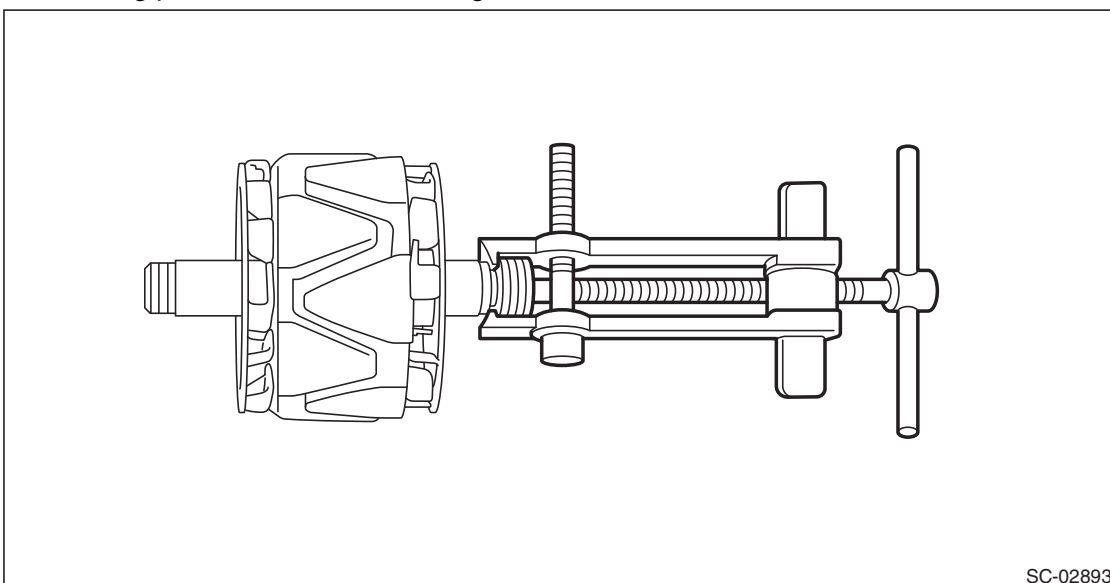
Generator

STARTING/CHARGING SYSTEMS

- (2) Firmly attach an appropriate tool (such as a correct size socket wrench) to the bearing inner race.



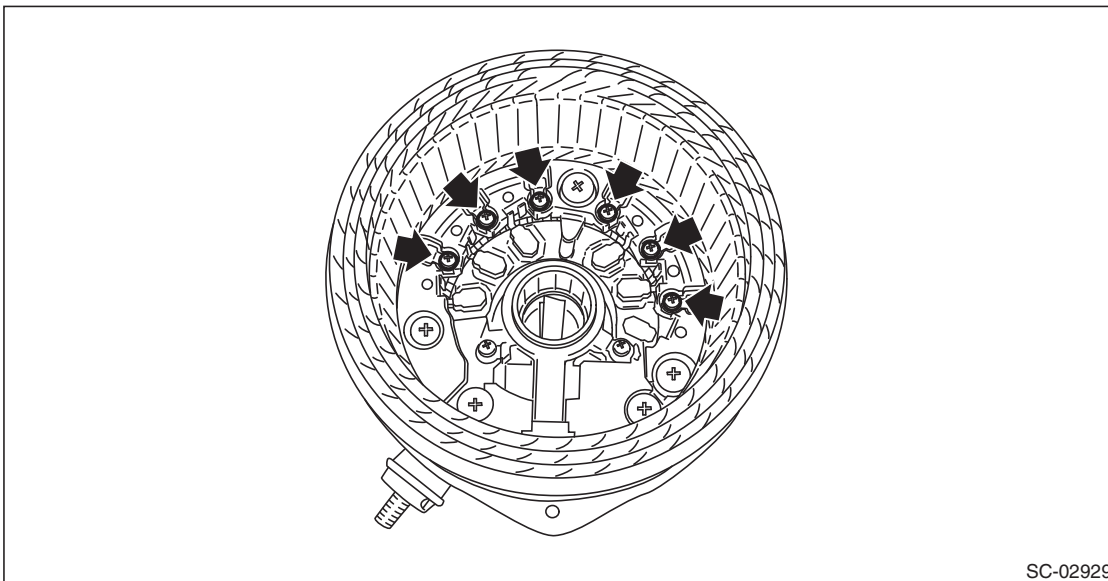
- (3) Use the press to push the ball bearings out from the front cover.
8) Using the bearing puller, remove the bearings from the rotor.



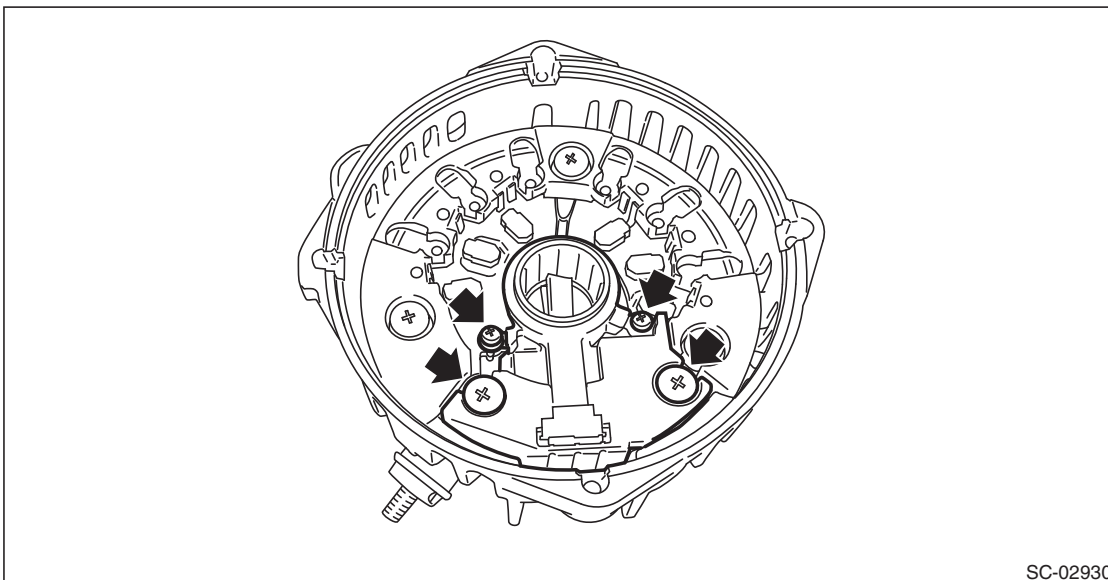
Generator

STARTING/CHARGING SYSTEMS

- 9) Remove six bolts which connect the rectifier and stator coil, then remove the stator coil.



- 10) Remove four screws which secure the IC regulator to the rear cover, then remove the IC regulator.

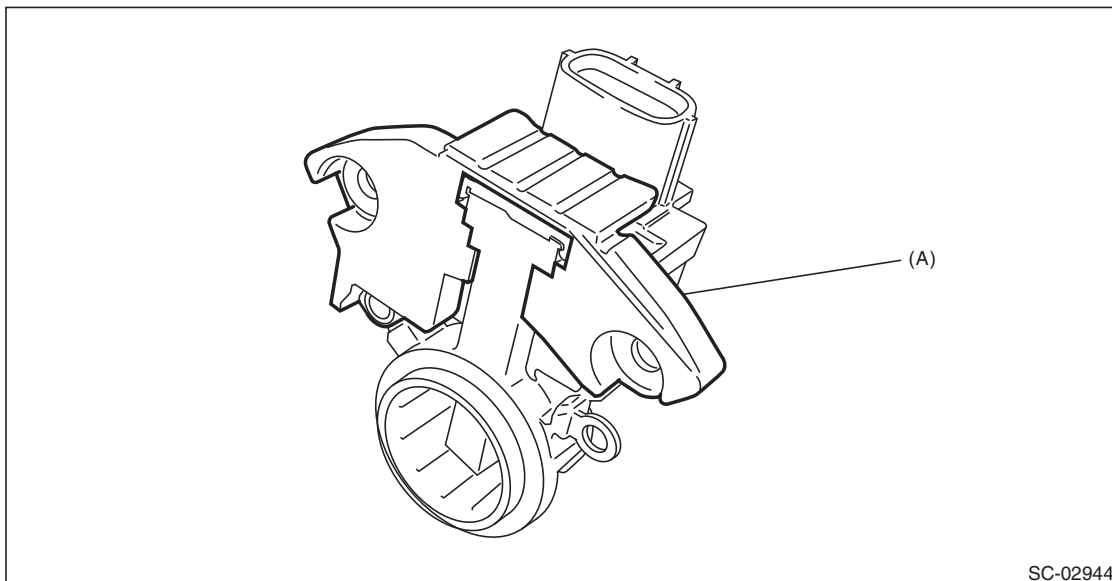


Generator

STARTING/CHARGING SYSTEMS

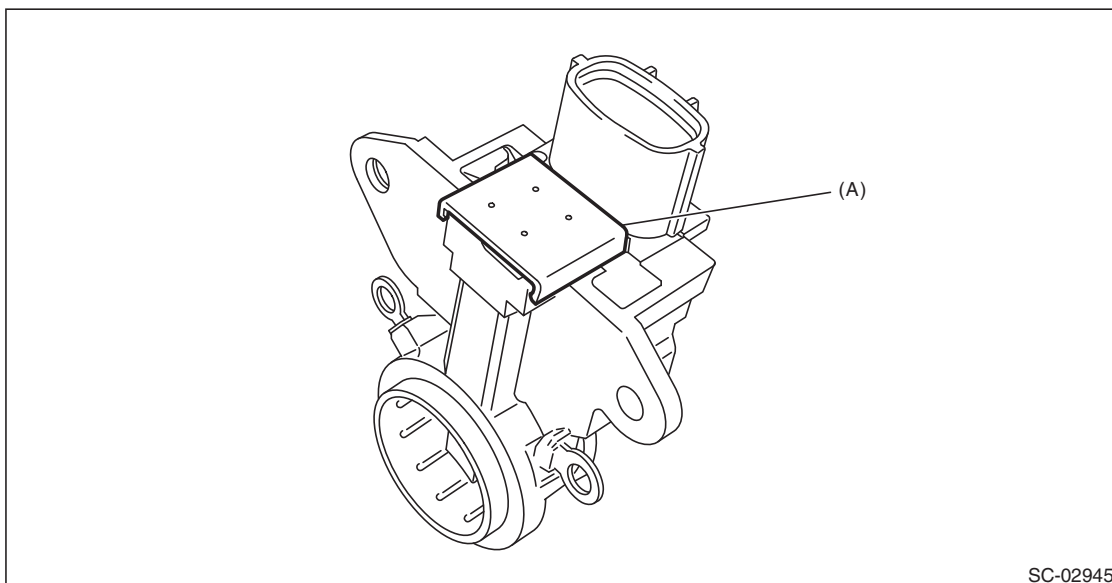
11) Use the following procedures to remove the brush.

(1) Remove the cover A.



(A) Cover A

(2) Remove the cover B.

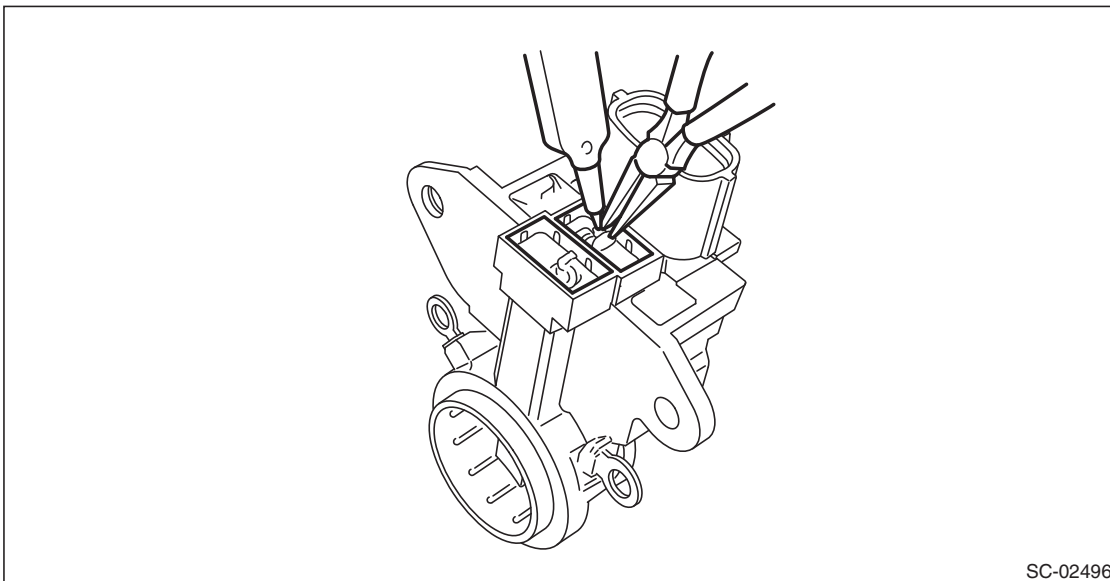


(A) Cover B

Generator

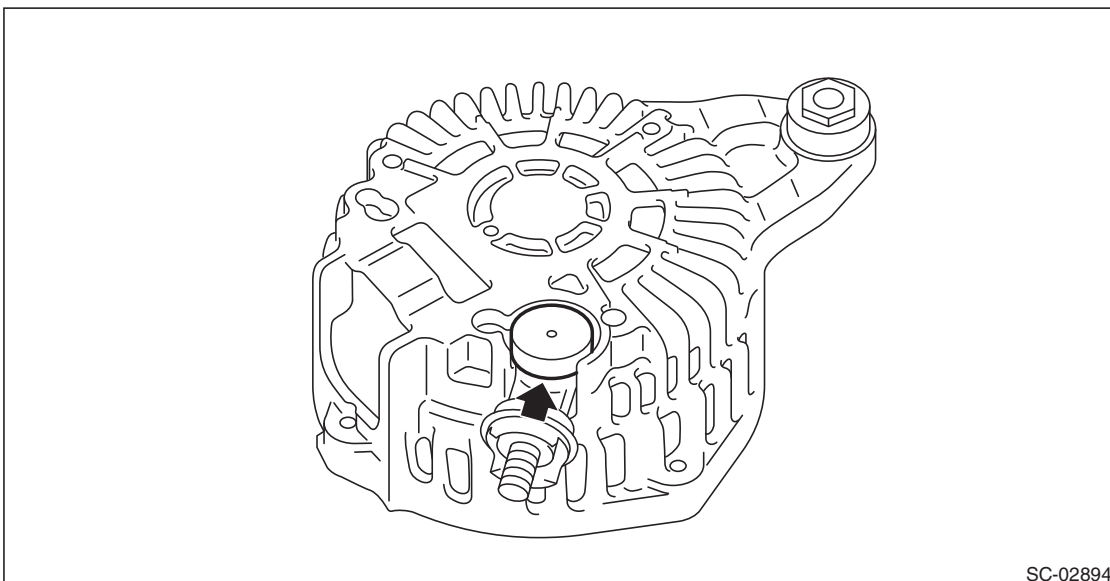
STARTING/CHARGING SYSTEMS

- (3) Disconnect the connection and remove the brush.



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- 12) Remove the rectifier as follows.
(1) Remove the cover on terminal B.



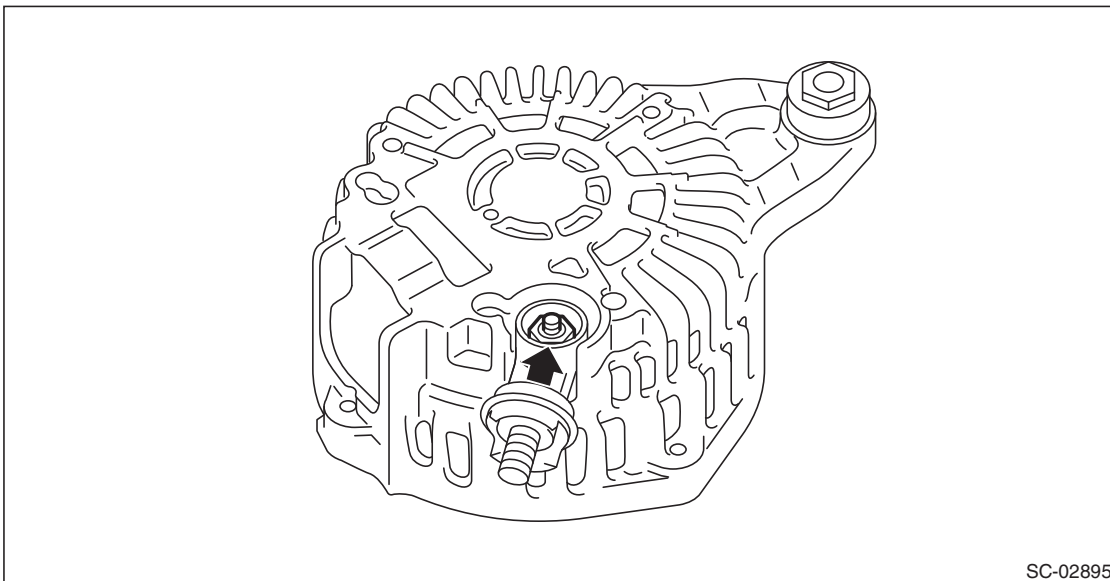
SC-02894



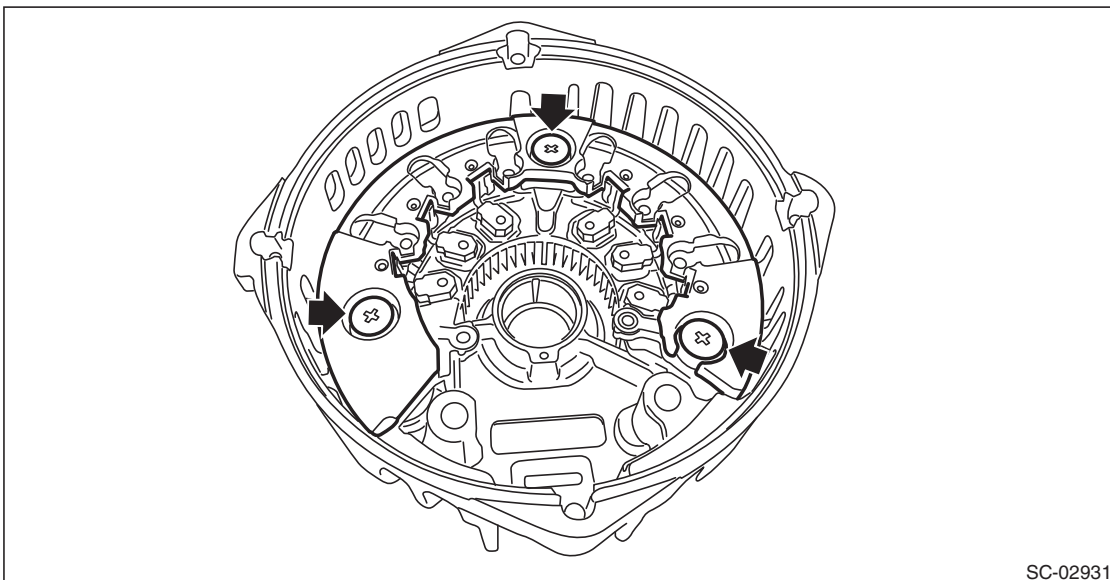
Generator

STARTING/CHARGING SYSTEMS

- (2) Remove the nut on terminal B.



- (3) Remove the bolts which secure the rectifier, and remove the rectifier.



Generator

STARTING/CHARGING SYSTEMS

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

- Refer to component for tightening torque of each part. <Ref. to SC(H4DO)-4, GENERATOR, COMPONENT, General Description.>
- After assembling, manually turn the pulley to check that the rotor rotates smoothly.

1) Assembling the rear cover and rectifier

Remove old silicone grease on the mating surface of rear cover and rectifier and apply new silicone grease.

CAUTION:

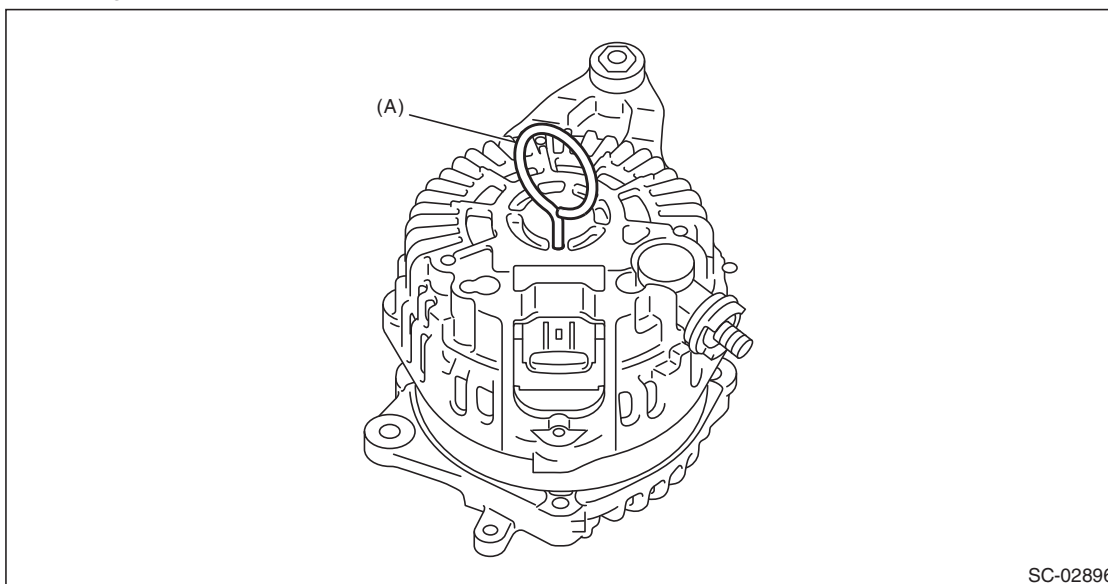
Do not apply silicone grease to the attachment threads of rectifier.

2) Push of the brush

Before assembling the front and rear parts, press the brush down into the brush holder, then fix the brush in that position by inserting a [1 mm (0.0394 in) dia., 40 — 50 mm (1.5748 — 1.9685 in) long] wire through the hole as shown in the figure.

CAUTION:

After assembling, remove the wire.



(A) Wire

3) Install the ball bearings.

- (1) Set the ball bearings in the front cover, then securely install an appropriate tool (such as a socket wrench of proper size) to the bearing outer race.
- (2) Using a press to press the ball bearings into the specified location.
- (3) Install the bearing retainer.

4) Install the bearings.

CAUTION:

Do not apply grease to the bearings. If there is any oil on the bearing box, remove it completely.

- (1) Use a press to install the bearings to the rotor shaft.
- (2) Heat the bearing box in rear cover at 50 to 60°C (122 to 140°F), and then press the bearing into rear cover.

E: INSPECTION

1. DIODE

CAUTION:
There is the possibility of damaging the diodes if a mega-tester (used to measure high voltages) or a similar measuring instrument is used. Never use a mega tester or equivalent for this test.

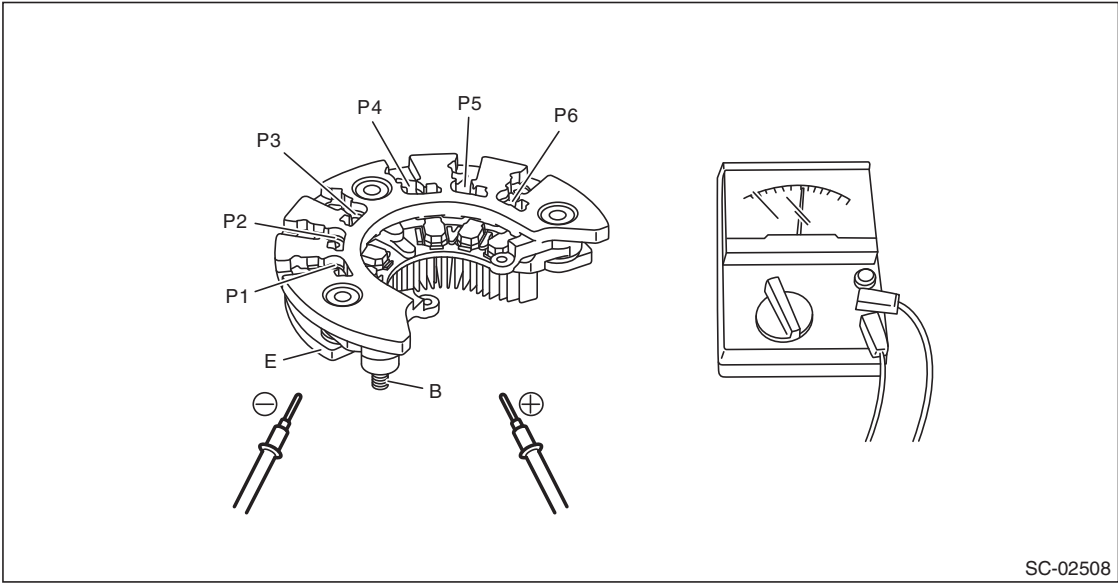
1) Check for continuity between the diode lead and terminal E or B. If continuity is not as shown in the table, replace the rectifier.

- At analog type tester

Tester lead		Continuity
-lead	+lead	
E	P1, P2, P3, P4, P5, P6	Yes
B		None
P1, P2, P3, P4, P5, P6	E	None
	B	Yes

- At digital type tester

Tester lead		Continuity
-lead	+lead	
E	P1, P2, P3, P4, P5, P6	None
B		Yes
P1, P2, P3, P4, P5, P6	E	Yes
	B	None



Generator

STARTING/CHARGING SYSTEMS

2. ROTOR

1) Slip ring surface

Inspect the slip rings for contamination or any roughness on the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. Replace the rotor if the slip ring is worn.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

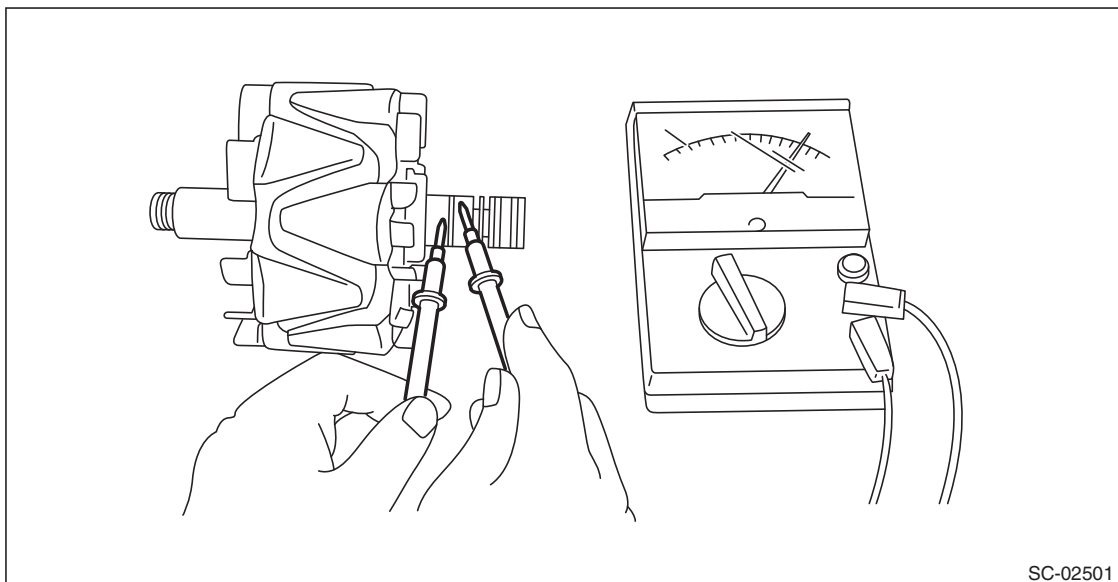
22.1 mm (0.870 in)

3) Continuity test

Using a circuit tester, check the resistance between slip rings. If the resistance is not within the standard, replace the rotor.

Standard:

Approx. 2.0 — 2.4 Ω



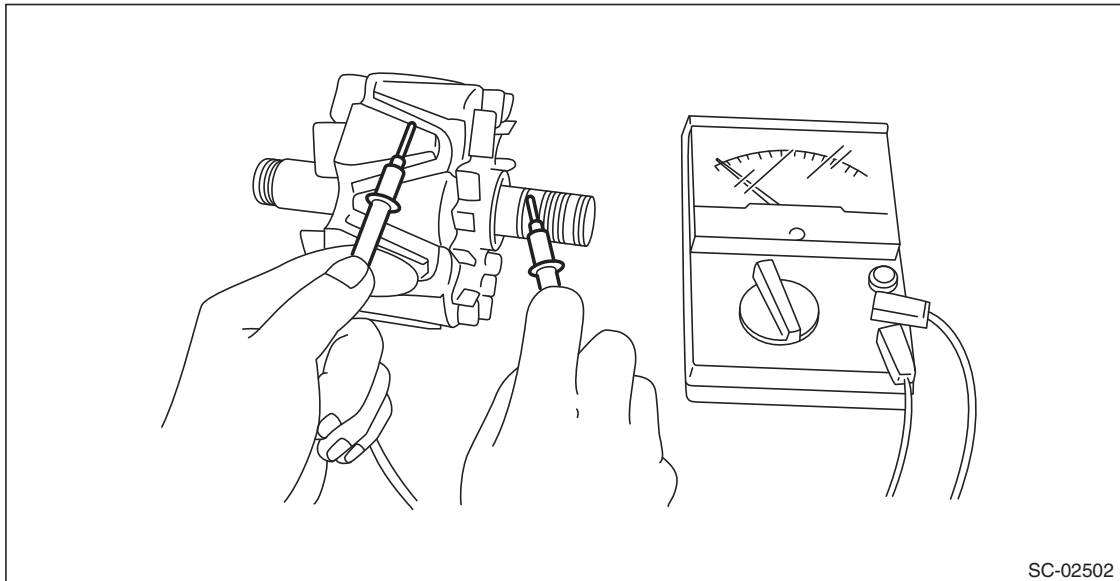
SC-02501

Generator

STARTING/CHARGING SYSTEMS

4) Insulation test

Check the continuity between slip ring and rotor core or shaft. If there is continuity, replace the rotor because the rotor coil is grounded.



5) Bearing

Check the bearings. If there is any noise, or the rotor does not rotate smoothly, replace the bearings.



Generator

STARTING/CHARGING SYSTEMS

3. STATOR COIL

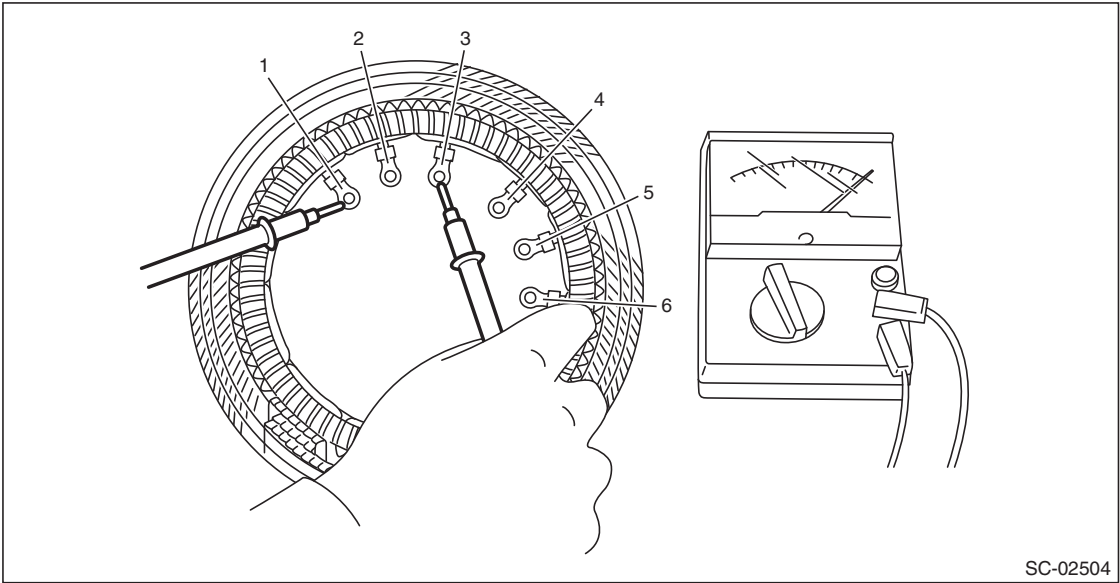
1) Continuity test

Inspect the continuity between the stator coil terminals. If continuity is not as shown in the table, replace the stator coil.

(A)					
1	2	3	4	5	6
					
					
					
					
					
					

SC-02503

(A) Terminals



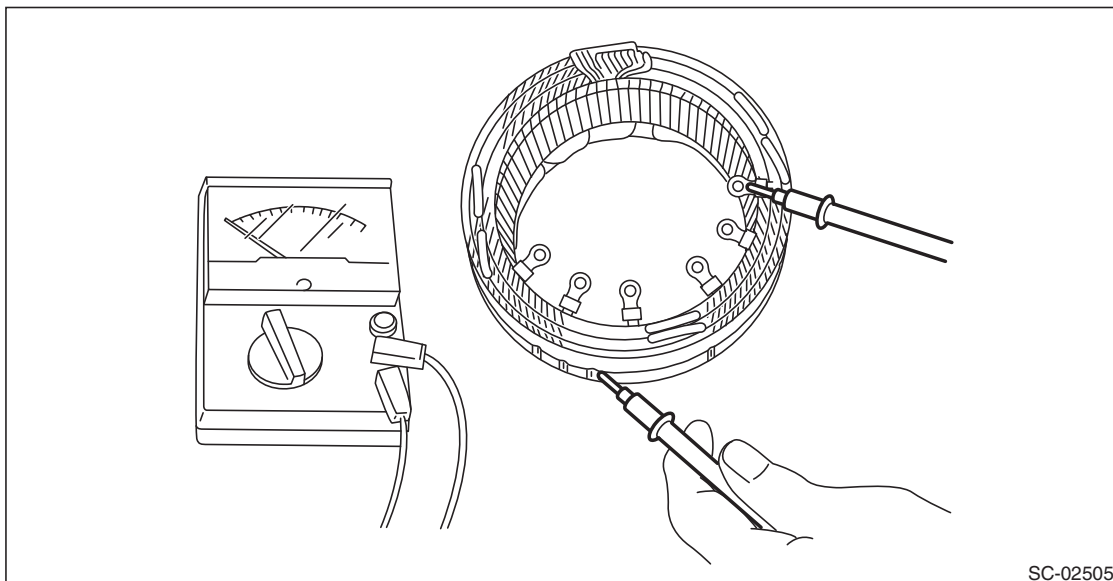
SC-02504

Generator

STARTING/CHARGING SYSTEMS

2) Insulation test

Inspect the continuity between the stator coil stator core and lead wire terminals. If there is continuity, replace the stator coil because the stator coil is grounded.



4. BRUSH

1) Measure the length of each brush. Replace the brush if wear exceeds service limits. There is a service limit mark (A) on each brush.

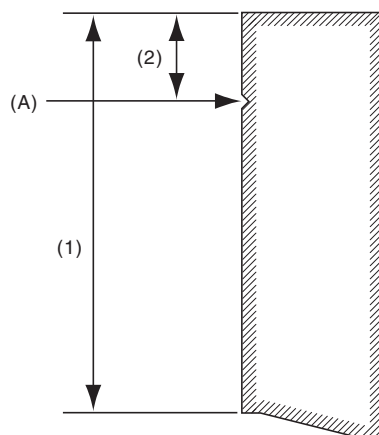
Brush length:

Standard (1)

22.5 mm (0.886 in)

Limit (2)

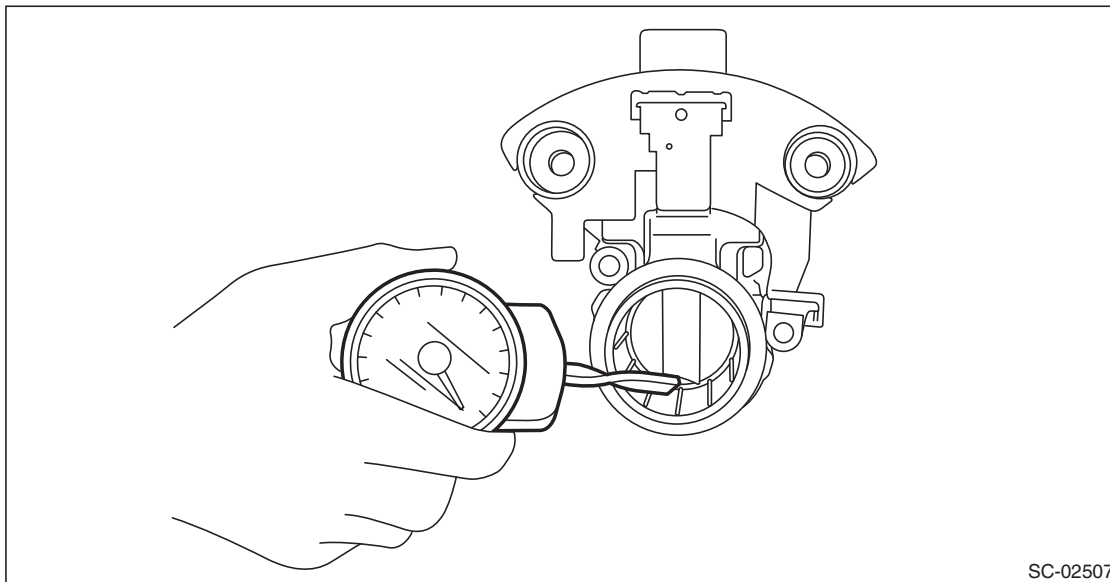
5.0 mm (0.197 in)



Generator

STARTING/CHARGING SYSTEMS

2) Check that there is appropriate pressure on the brush spring. Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.0787 in). Then measure the pressure of brush spring. If the pressure is 1.7 N (173 gf, 6.11 ozf) or less, replace the brush spring. 4.1 — 5.3 N (418 — 540 gf, 14.75 — 19.06 ozf) pressure is required on the new spring.



SC-02507

5. BALL BEARING

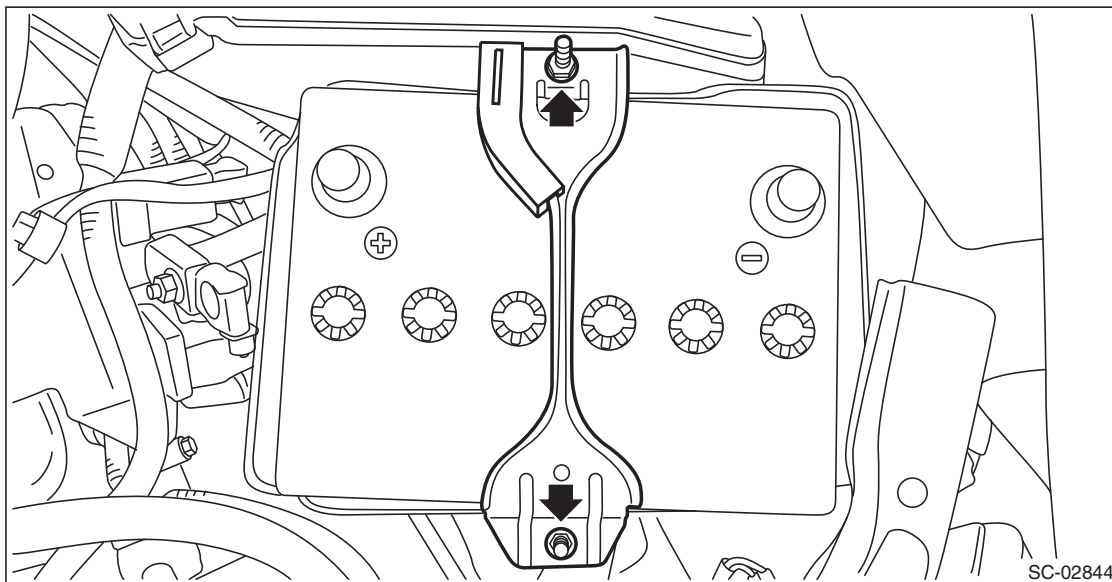
Check the ball bearings. Replace the ball bearings if there is resistance in the rotation, or if there is any abnormal noise.



4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) terminal after disconnecting the negative (–) terminal of battery.
- 2) Remove the battery cable holder from the battery rod.
- 3) Remove the flange nut from battery rod and remove battery holder.



- 4) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.5 N·m (0.4 kgf-m, 2.6 ft-lb)

NOTE:

- Clean the battery cable terminals and apply grease to retard the formation of corrosion.
- Connect the positive (+) terminal, and then connect the negative (–) terminal of the battery.
- After the battery is installed, initial diagnosis of the electronic throttle control is performed. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.

C: INSPECTION

WARNING:

- Electrolyte is corrosive acid, and has toxicity; be careful of handling the fluid.
- Make sure the electrode does not come into contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
- In addition, be careful not to let the electrode contact with the coated parts.
- Be careful when handling the batteries because they produce explosive gases.
- Be sure to keep battery away from any fire.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. In addition, never lean over the battery.
- Ventilate sufficiently when using or charging battery in enclosed space.
- Before starting work, remove rings, metal watch-bands, and other metal jewelry.
- Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle.

Battery

STARTING/CHARGING SYSTEMS

1. EXTERNAL PARTS

Check the battery case, top cover, vent plugs, and terminal posts for dirt or cracks. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL

Check the electrolyte level in each cell. If the level is below MIN level, bring the level to MAX level by pouring distilled water into the battery cell. Do not fill beyond MAX level.

3. SPECIFIC GRAVITY OF ELECTROLYTE

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following calculation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

S_{20} : Specific gravity corrected at electrolyte temperature of 20°C

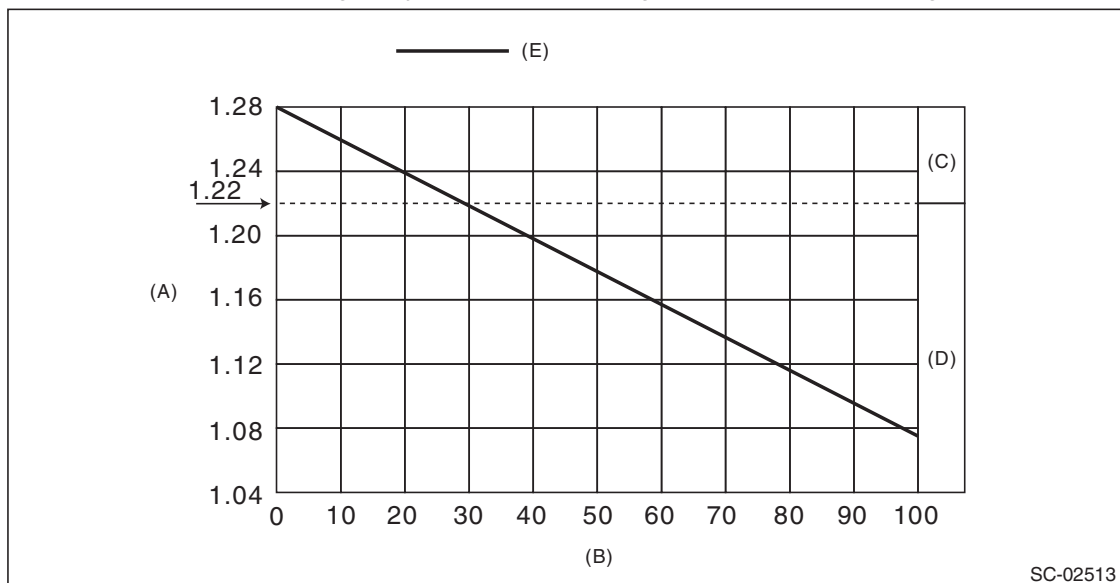
St: Measured specific gravity

t: Measured temperature (°C)

Judge whether or not the battery requires charging according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]

2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between specific gravity and state of charge is as shown in the figure.



(A) Specific gravity [20°C (68°F)]

(B) Amount of discharge (%)

(C) Good

(D) Need to charge

(E) Battery with standard specific gravity 1.280 [20°C (68°F)]

SC-02513

D: MEASUREMENT

WARNING:

Do not bring an open flame close to the battery when working.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.
- Be careful since battery electrolyte overflows while charging the battery.
- Observe instructions when handling the battery charger.
- Before charging the battery on the vehicle, disconnect the battery ground terminal to prevent damage of generator diodes or other electrical units.

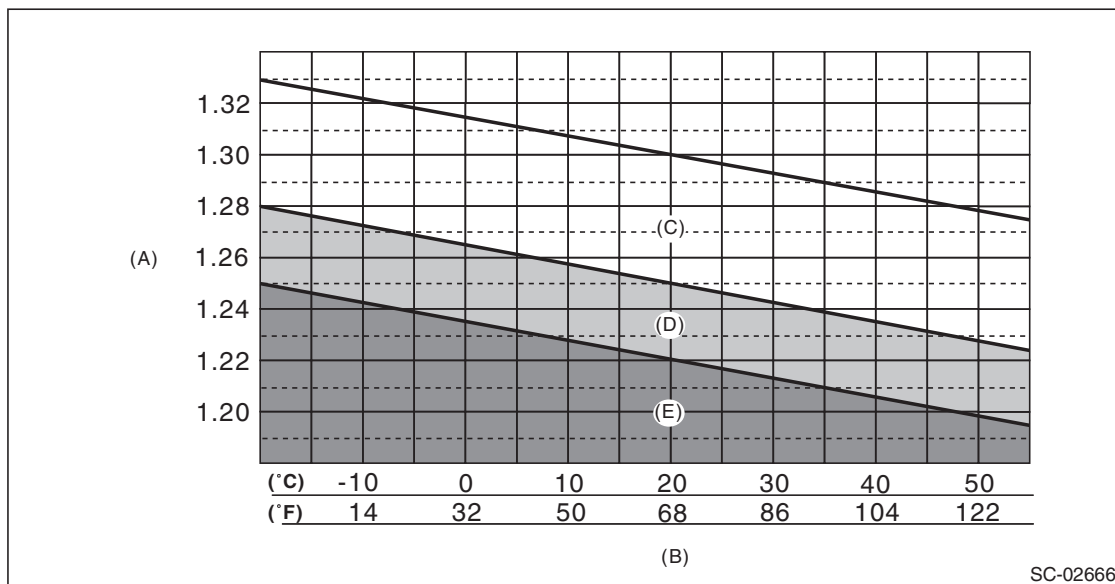
1. JUDGMENT OF BATTERY IN CHARGED CONDITION

- 1) Specific gravity of electrolyte should be held within the specific range of 1.250 — 1.290 for one hour or more.
- 2) Voltage per battery cell should be held at a specific value in a range of 2.5 — 2.8 V for one hour or more.

2. CHECK CONDITION OF CHARGE WITH HYDROMETER

CAUTION:

- Charge the battery if the difference is 0.04 or more, even though the specific gravity of each cell is normal.
- After charging, if the difference between the specific gravity of each cell is 0.04 or more, replace the battery.



(A) Specific gravity

(B) Electrolyte temperature

(C) Good

(D) Caution

(E) Need charging

3. NORMAL CHARGING

Charge the battery at the current value specified by manufacturer or at approximately 1/10 of battery's amper-hour rating.

Battery

STARTING/CHARGING SYSTEMS

4. QUICK CHARGING

CAUTION:

- Observe the items in “3. NORMAL CHARGING”.
- Never use 10 A or more when charging the battery because it will shorten the battery life.

Quick charging is a method that the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, quick charging must be carried out within a current range that will not raise the electrolyte temperature to 40°C (104°F) or more.

Also the quick charging is a temporary mean to bring battery voltage up to some level, and battery should be charged slowly with low current as a rule.

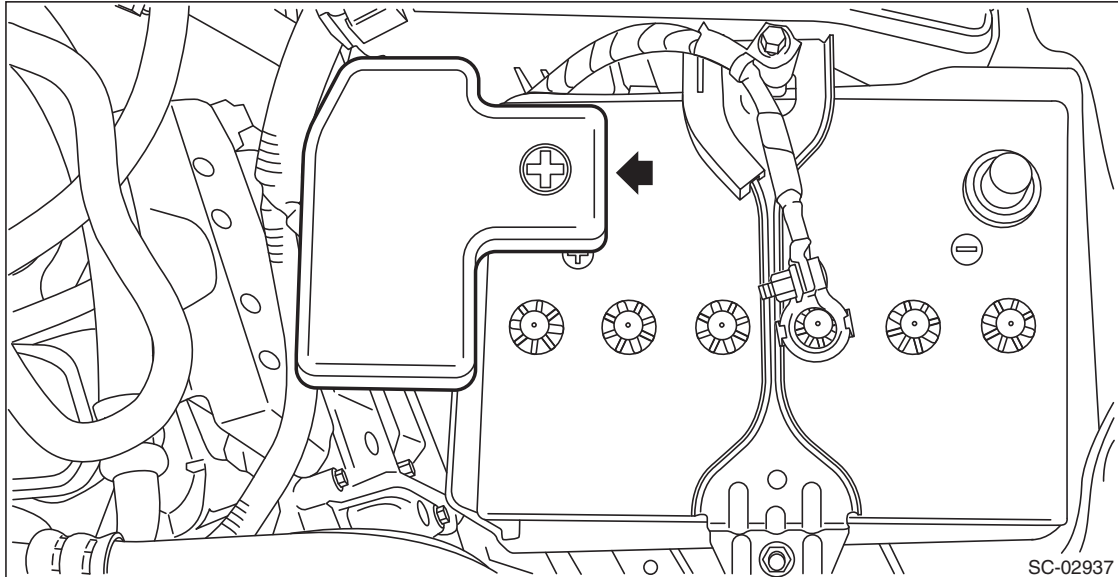
Battery Current & Temperature Sensor

STARTING/CHARGING SYSTEMS

5. Battery Current & Temperature Sensor

A: REMOVAL

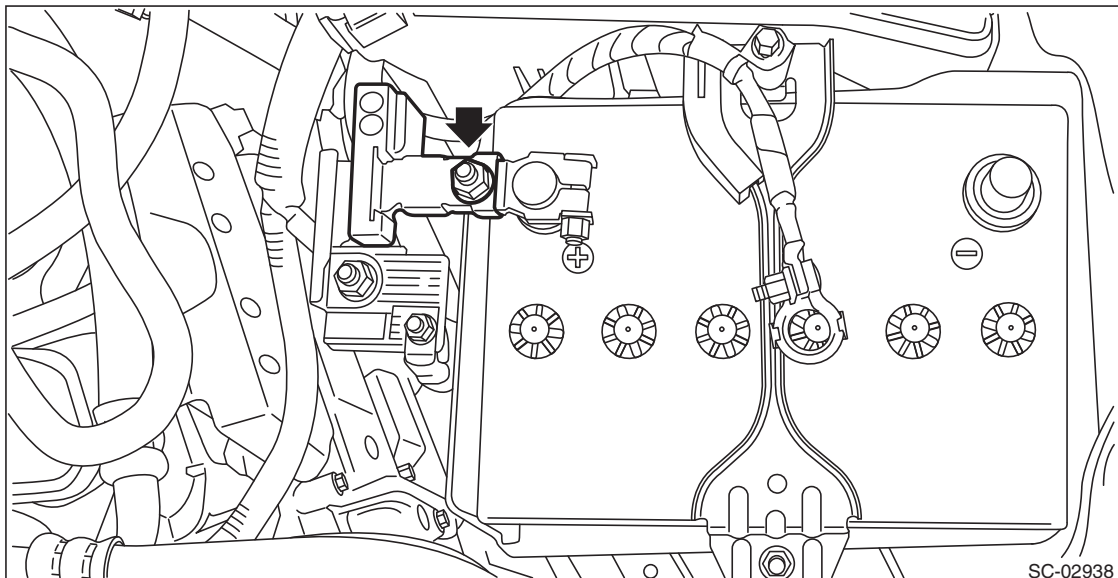
- 1) Disconnect the ground cable from battery.
- 2) Remove the battery terminal boot.



- 3) Remove the nut which holds the battery current & temperature sensor.

CAUTION:

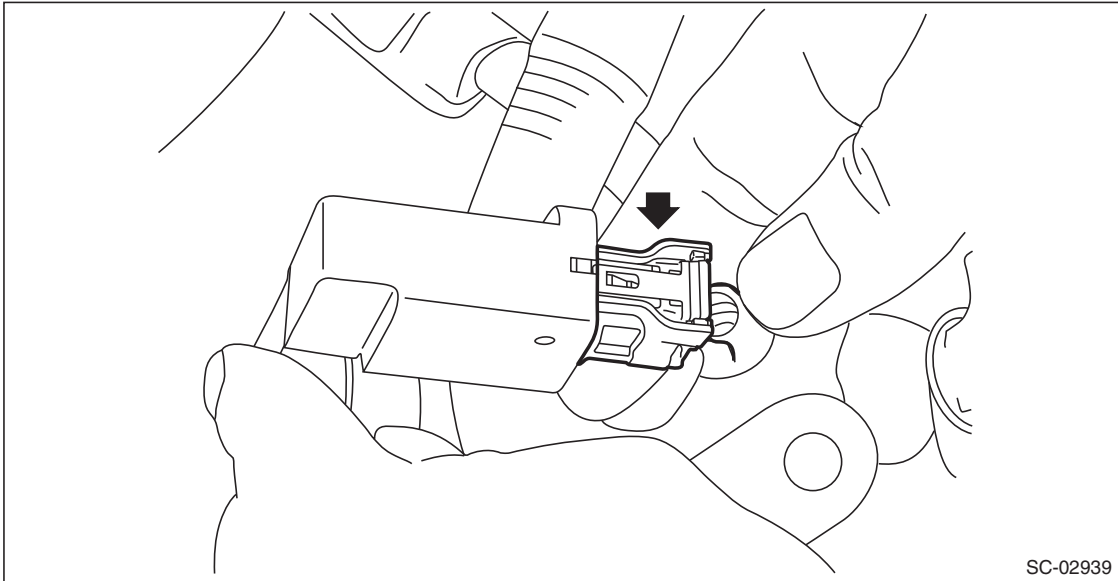
- Hold the terminal bracket with your hand when loosening the nut to avoid deforming the bracket.
- While working, be sure to protect metal parts with cloth.



Battery Current & Temperature Sensor

STARTING/CHARGING SYSTEMS

4) Disconnect the connectors from the battery current & temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Hold the terminal bracket with your hand when tightening the nut to avoid deforming the bracket.
- Install the terminal bracket so that it is level to the battery.
- While working, be sure to protect metal parts with cloth.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



Battery Current & Temperature Sensor

STARTING/CHARGING SYSTEMS

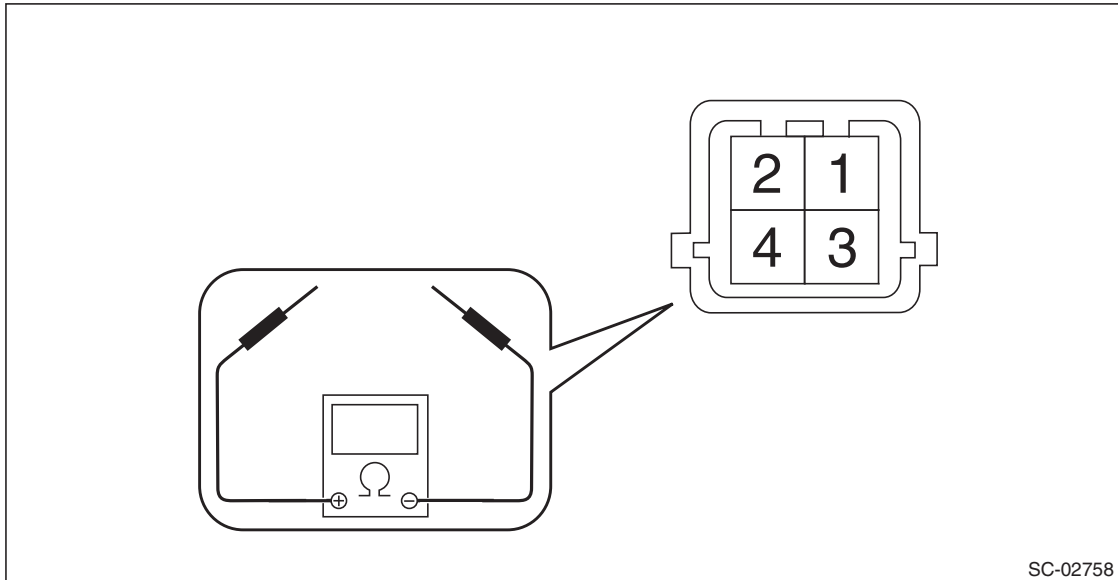
C: INSPECTION

1. CHECK BATTERY CURRENT SENSOR UNIT

CAUTION:

Pay attention to polarity when measuring the resistance in the battery current sensor.

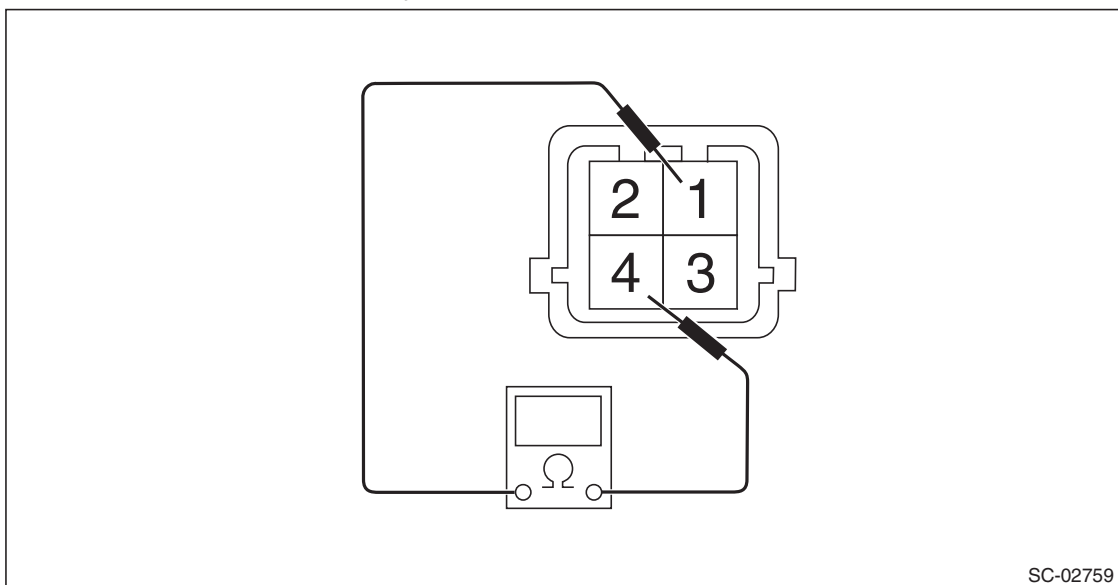
Check the resistance between the battery current sensor terminals.



Terminal No.	Standard
2 (+) and 3 (-)	0 — 0.5 k Ω
2 (+) and 4 (-)	3 — 10 k Ω
3 (+) and 4 (-)	3 — 10 k Ω

2. CHECK BATTERY TEMPERATURE SENSOR UNIT

Check the resistance between the battery temperature sensor terminals.



Temperature	Terminal No.	Standard
20 — 30°C (68 — 86°F)	1 and 4	1.3 — 3.2 k Ω

Battery Current & Temperature Sensor

STARTING/CHARGING SYSTEMS

3. OTHER INSPECTIONS

Check that the battery current & temperature sensor has no deformation, cracks or other damages.